HRS DOCUMENTATION RECORD COVER SHEET

Name of Site: Kerr-McGee Chemical Corp – Jacksonville

EPA ID No.: FLD039049101

Contact Persons

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Pathways, Components, or Threats Not Scored

The soil exposure and air migration pathways were not scored in this Hazard Ranking System (HRS) documentation record because they are not expected to significantly contribute to the overall score.

HRS DOCUMENTATION RECORD

Name of Site:	Kerr-McGee Chemical Corp – Jacksonville
Date Prepared:	September 2009
Street Address of Site*:	1611 Talleyrand Avenue
City, County, State, Zip:	Jacksonville, Duval County, Florida, 32206
General Location in the State:	Northeast corner of state, near the Atlantic Ocean
Topographic Map:	Jacksonville, Florida, 1983 and Arlington, Florida, 1982
Latitude:	30.3442° North
Longitude:	81.6265° West

The coordinates above for Kerr-McGee Chemical Corp – Jacksonville (Kerr-McGee – Jacksonville) were measured at northwestern corner of the backfilled surface impoundment located in the northern portion of the property (Refs. 3; 4).

* The street address, coordinates, and contaminant locations presented in this HRS documentation record identify the general area in which the site is located. They represent one or more locations EPA considers to be part of the site based on the screening information EPA used to evaluate the site for NPL listing. EPA lists its national priorities among the known "releases or threatened releases" of hazardous substances; thus, the focus is on the release, not precisely delineated boundaries. A site is defined where a hazardous substance has been "deposited, stored, placed, or otherwise come to be located." Generally, HRS scoring and the subsequent listing of a release represent the initial determination that a certain area may need to be addressed under CERCLA. Accordingly, EPA contemplates that the preliminary description of facility boundaries at the time of scoring will be defined as more information is developed as to where the contamination has come to be located.

Scores

Migration Pathway	Pathway Score
Ground Water Migration Pathway	100.00
Surface Water Migration Pathway	100.00
Soil Exposure Pathway	Not Scored
Air Migration Pathway	Not Scored
HRS SITE SCORE	**70.71**

WORKSHEET FOR COMPUTING HRS SITE SCORE

	S Pathway	S^2 Pathway
Ground Water Migration Pathway Score (S_{gw})	100	10,000
Surface Water Migration Pathway Score (S_{sw})	100	10,000
Soil Exposure Pathway Score (S_s)	Not Scored	Not Scored
Air Migration Pathway Score (S_a)	Not Scored	Not Scored
$S^2_{gw} + S^2_{sw} + S^2_s + S^2_a$		20,000
$(S^2_{gw} + S^2_{sw} + S^2_s + S^2_a) / 4$		5,000
$\sqrt{(S^2_{gw} + S^2_{sw} + S^2_s + S^2_a) / 4}$		**70.71**

HRS Table 3-1 –Ground Water Migration Pathway Scoresheet

Factor Categories and Factors	Maximum Value	Value Assigned
Likelihood of Release to an Aquifer:		
1. Observed Release	550	0
2. Potential to Release:		
2a. Containment	10	10
2b. Net Precipitation	10	3
2c. Depth to Aquifer	5	1
2d. Travel Time	35	5
2e. Potential to Release [lines 2a x (2b + 2c + 2d)]	500	90
3. Likelihood of Release (higher of lines 1 and 2e)	550	90
Waste Characteristics:		
4. Toxicity/Mobility	[a]	10,000
5. Hazardous Waste Quantity	[a]	100
6. Waste Characteristics	100	32
Targets:		
7. Nearest Well	50	20
8. Population:		
8a. Level I Concentrations	[b]	0
8b. Level II Concentrations	[b]	0
8c. Potential Contamination	[b]	13,375.9
8d. Population (lines 8a + 8b + 8c)	[b]	13,375.9
9. Resources	5	0
10. Wellhead Protection Area	20	5
11. Targets (lines 7 + 8d + 9 + 10)	[b]	13,400.9
Ground Water Migration Score For An Aquifer:		
12. Aquifer Score [(lines 3 x 6 x 11)/82,500][c]	100	100
Ground Water Migration Pathway Score:		
13. Pathway Score (S_{gw}), (highest value from line 12 for all aquifers evaluated)[c]	100	100

Notes:

[a] Maximum value applies to waste characteristics category
[b] Maximum value not applicable
[c] Do not round to nearest integer

HRS Table 4-1 –Surface Water Migration Pathway Scoresheet

Table 4-1 –Surface Water Overland/Flood Migration Component Scoresheet				
	Factor Categories and Factors	Maximum Value	Value Assigned	
Drinking Water Threat				
Likelihood of Release:				
	1. Observed Release	550	550	
	2. Potential to Release by Overland Flow:			
	2a. Containment	10		
	2b. Runoff	25		
	2c. Distance to Surface Water	25		
	2d. Potential to Release by Overland Flow [lines 2a(2b + 2c)]	500		
	3.Potential to Release by Flood:			
	3a. Containment (Flood)	10		
	3b. Flood Frequency	50		
	3c. Potential to Release by Flood (lines 3a x 3b)	500		
	4. Potential to Release (lines 2d + 3c, subject to a maximum of 500)	500		
	5. Likelihood of Release (higher of lines 1 and 4)	550		550
Waste Characteristics:				
	6. Toxicity/Persistence	(a)	10,000	
	7. Hazardous Waste Quantity	(a)	100	
	8. Waste Characteristics	100		32
Targets:				
	9. Nearest Intake	50		
	10. Population:			
	10a. Level I Concentrations	(b)		
	10b. Level II Concentrations	(b)		
	10c. Potential Contamination	(b)		
	10d. Population (lines 10a + 10b + 10c)	(b)		
	11. Resources	5	5	
	12. Targets (lines 9 + 10d + 11)	(b)		5
Drinking Water Threat Score:				
	13. Drinking Water Threat Score [(lines 5x8x12)/82,500, subject to a maximum of 100]	100		1.06
Human Food Chain Threat				
Likelihood of Release:				
	14. Likelihood of Release (same value as line 5)	550		550
Waste Characteristics:				
	15. Toxicity/Persistence/Bioaccumulation	(a)	500,000,000	
	16. Hazardous Waste Quantity	(a)	100	
	17. Waste Characteristics	1,000		320
Targets:				
	18. Food Chain Individual	50	45	

Table 4-1 –Surface Water Migration Pathway Scoresheet (Continued)				
	Factor Categories and Factors	**Maximum Value**	**Value Assigned**	
	19. Population			
	19a. Level I Concentrations	(b)		
	19b. Level II Concentrations	(b)	0.03	
	19c. Potential Human Food Chain Contamination	(b)		
	19d. Population (lines 19a + 19b + 19c)	(b)	0.03	
	20. Targets (lines 18 + 19d)	(b)		45.03
Human Food Chain Threat Score:				
	21. Human Food Chain Threat Score [(lines 14x17x20)/82,500, subject to maximum of 100]	100		96
	Environmental Threat			
Likelihood of Release:				
	22. Likelihood of Release (same value as line 5)	550		550
Waste Characteristics:				
	23. Ecosystem Toxicity/Persistence/Bioaccumulation	(a)	500,000,000	
	24. Hazardous Waste Quantity	(a)	100	
	25. Waste Characteristics	1,000		320
Targets:				
	26. Sensitive Environments			
	26a. Level I Concentrations	(b)		
	26b. Level II Concentrations	(b)	150	
	26c. Potential Contamination	(b)		
	26d. Sensitive Environments (lines 26a + 26b + 26c)	(b)	150	
	27. Targets (value from line 26d)	(b)		150
Environmental Threat Score:				
	28. Environmental Threat Score [(lines 22x25x27)/82,500 subject to a maximum of 60]	60		60
	Surface Water Overland/Flood Migration Component Score for a Watershed			
	29. Watershed Score[c] (lines 13+21+28, subject to a maximum of 100)	100		100
Surface Water Overland/Flood Migration Component Score				
	30. Component Score (S_{sw})[c] (highest score from line 29 for all watersheds evaluated)		100	100

Notes:

[a] Maximum value applies to waste characteristics category

[b] Maximum value not applicable

[c] Do not round to nearest integer

N

0 500 1,000 Feet

1:12,000

Map Source:
Property Boundary:
Atlanta Environmental Management, Inc.
Final Feasibility Study – Revision 2,
Figure 1-3, June 2008 (Reference 6).
Jacksonville GIS Property Information Website,
June 23, 2009 (Reference 9).
USGS Topographic Quadrangles,
Jacksonville, FL 1983
& Arlington, FL 1982

EPA United States Environmental Protection Agency

KERR-McGEE
CHEMICAL CORP - JACKSONVILLE
JACKSONVILLE,
DUVAL COUNTY,
FLORIDA
TDD No.TTEMI-05-003-0051

FIGURE 1
FACILITY LOCATION

TETRA TECH

LEGEND

- Kerr-McGee Chemical Corp - Jacksonville Property Boundary
- Concrete Pad
- Fill Area
- Foundation
- Impoundment
- Adjacent Structures
- Road Outline

0 150 300 Feet

1:3,600

Note:
Fasco - Florida Agricultural and Supply Company

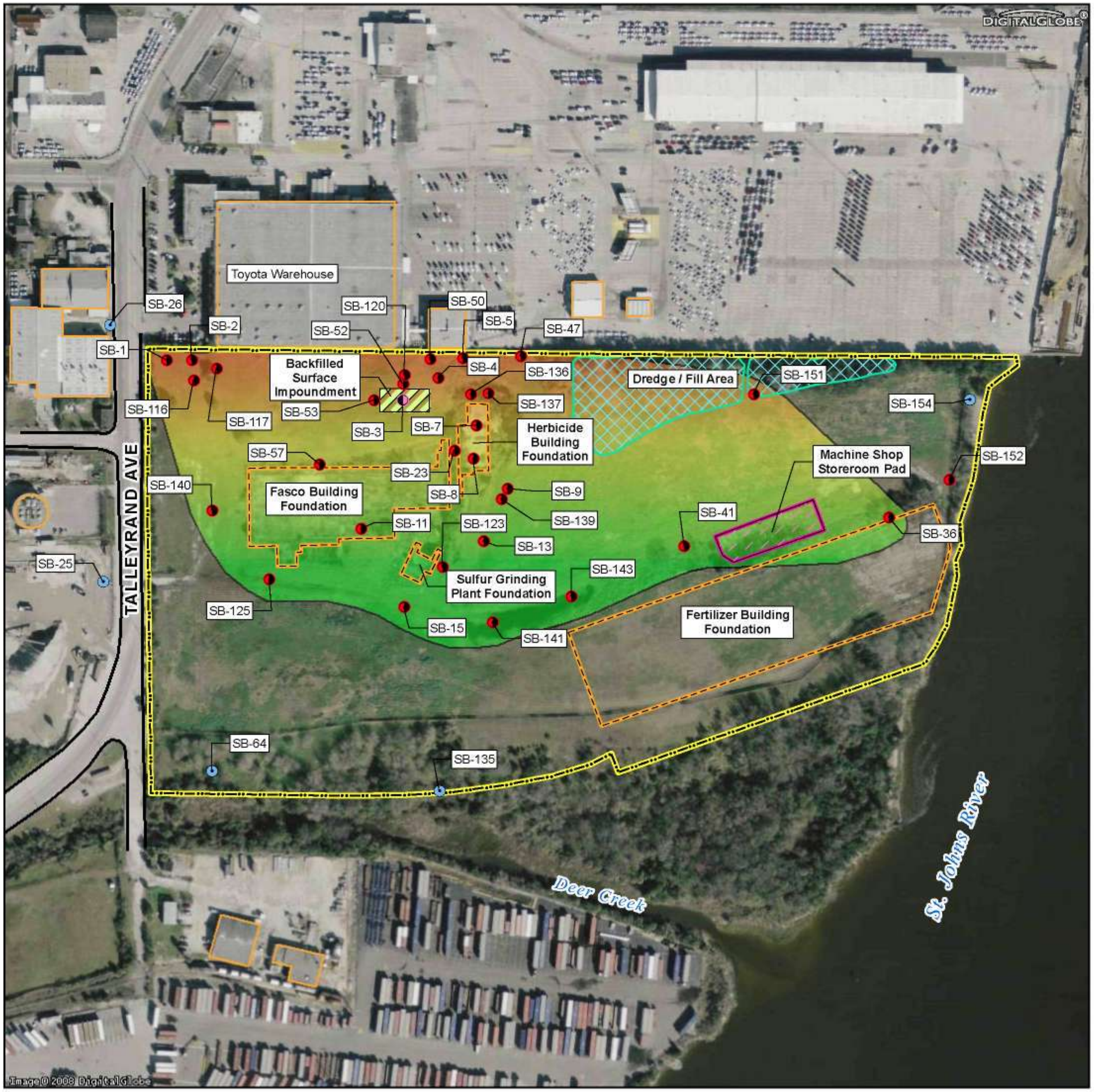
Source:
Aerial photograph, GlobeXplorer, 1/2008;
Shaw Environmental, Inc. Final Remedial Investigation Report prepared for Kerr McGee Chemical, LLC, January 2006 (Reference 5);
Atlanta Environmental Management, Inc., Final Feasibility Study, Revision 2, Prepared for Kerr McGee Chemical LLC, June 2008 (Reference 6).
Jacksonville GIS Property Information Website, June 23, 2009 (Reference 9).

United States Environmental Protection Agency

KERR-McGEE
CHEMICAL CORP - JACKSONVILLE
JACKSONVILLE,
DUVAL COUNTY,
FLORIDA
TDD No.TTEMI-05-003-0051

FIGURE 2
FACILITY LAYOUT

TETRA TECH



LEGEND

Soil Boring Locations

- Source No. 1 Sample
- Source No. 2 Sample
- Background Sample
- Kerr-McGee Chemical Corp - Jacksonville Property Boundary
- Concrete Pad
- Fill Area
- Foundation
- Source No. 1
- Source No. 2
- Adjacent Structures
- Road Outline

0 150 300 Feet

1:3,600

Note:
Fasco - Florida Agricultural and Supply Company

Source:
Aerial photograph, GlobeXplorer, 1/2008;
Shaw Environmental, Inc. Final Remedial Investigation Report prepared for Kerr McGee Chemical, LLC, January 2006 (Reference 5);
Atlanta Environmental Management, Inc., Final Feasibility Study, Revision 2, Prepared for Kerr McGee Chemical LLC, June 2008 (Reference 6).
Jacksonville GIS Property Information Website, June 23, 2009 (Reference 9).

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KERR-McGEE
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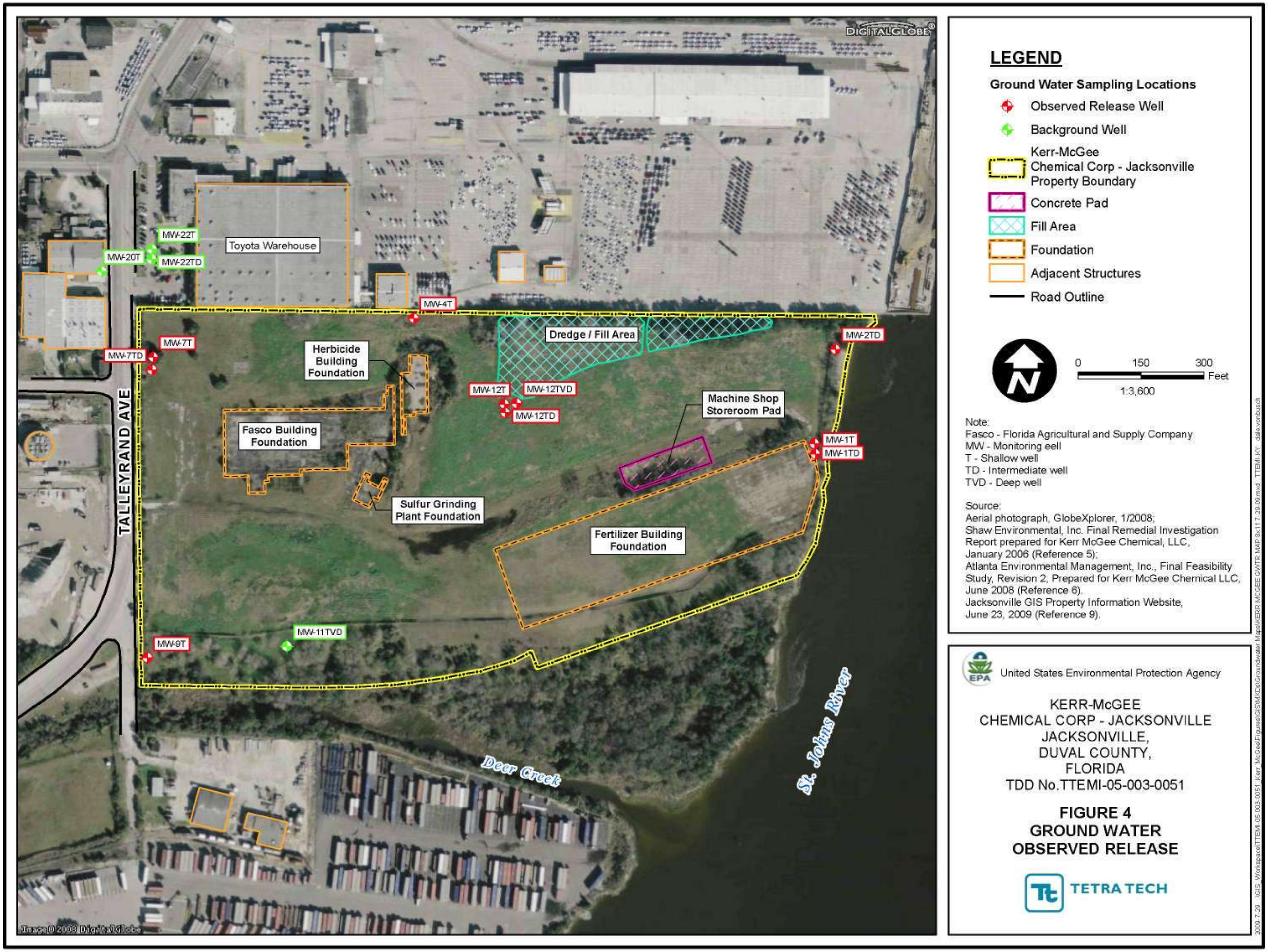
JACKSONVILLE,
DUVAL COUNTY,
FLORIDA
TDD No.TTEMI-05-003-0051

FIGURE 3
SOURCE LOCATION

TETRA TECH



DIGITALGLOBE
Toyota Warehouse
MW-22T
MW-20T
MW-22TD
MW-4T
MW-7T
MW-7TD
Herbicide Building Foundation
Dredge / Fill Area
MW-2TD
MW-12T
MW-12TVD
MW-12TD
Machine Shop Storeroom Pad
Fasco Building Foundation
MW-1T
MW-1TD
Sulfur Grinding Plant Foundation
Fertilizer Building Foundation
TALLEYRAND AVE
MW-11TVD
MW-9T
Deer Creek
St. Johns River
Image © 2008 DigitalGlobe
LEGEND
Ground Water Sampling Locations
Observed Release Well
Background Well
Kerr-McGee Chemical Corp - Jacksonville Property Boundary
Concrete Pad
Fill Area
Foundation
Adjacent Structures
Road Outline
0
150
300
Feet
1:3,600
Note:
Fasco - Florida Agricultural and Supply Company
MW - Monitoring eell
T - Shallow well
TD - Intermediate well
TVD - Deep well
Source:
Aerial photograph, GlobeXplorer, 1/2008;
Shaw Environmental, Inc. Final Remedial Investigation Report prepared for Kerr McGee Chemical, LLC, January 2006 (Reference 5);
Atlanta Environmental Management, Inc., Final Feasibility Study, Revision 2, Prepared for Kerr McGee Chemical LLC, June 2008 (Reference 6).
Jacksonville GIS Property Information Website, June 23, 2009 (Reference 9).
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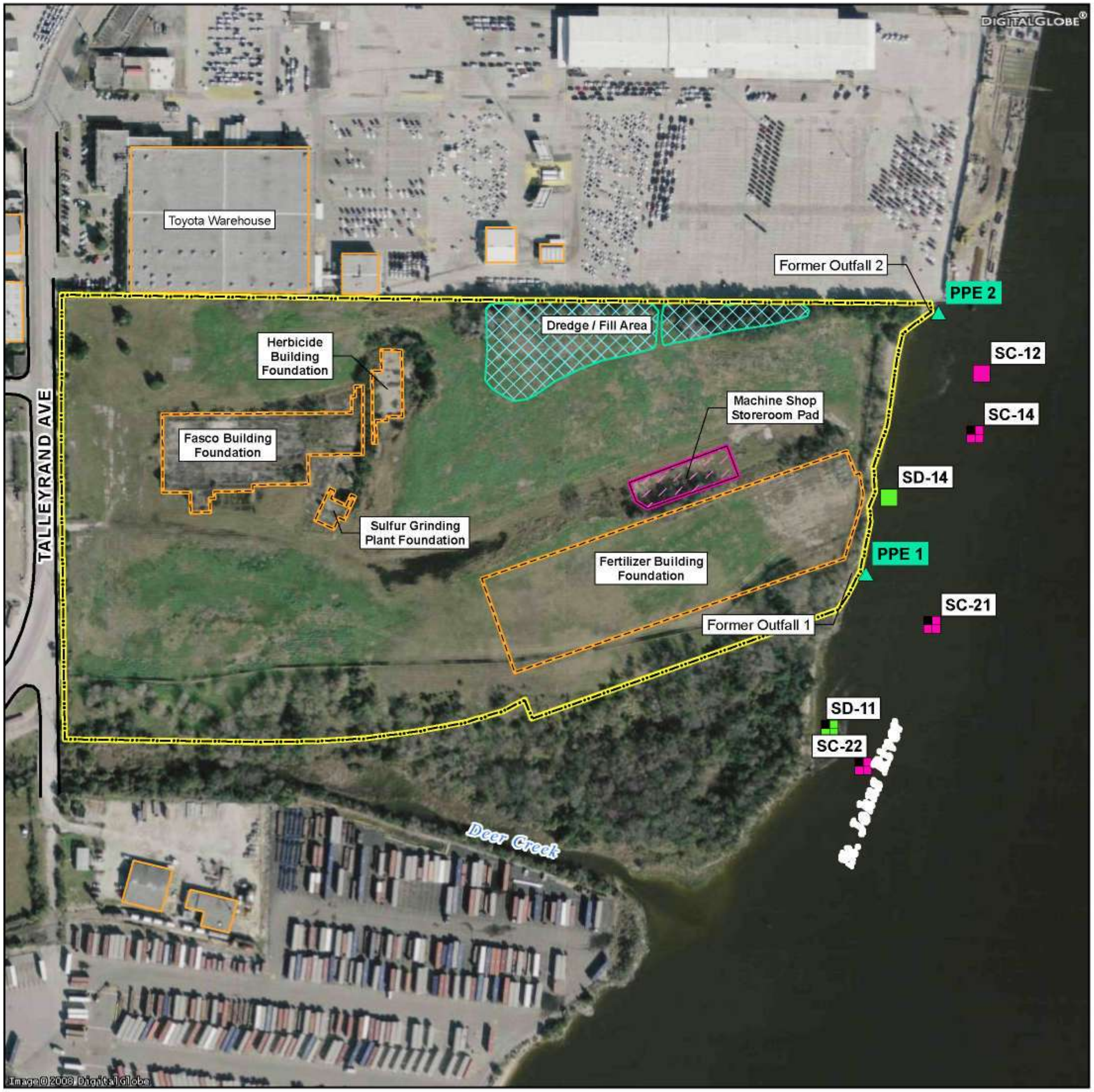
KERR-McGEE
CHEMICAL CORP - JACKSONVILLE
JACKSONVILLE,
DUVAL COUNTY,
FLORIDA
TDD No.TTEMI-05-003-0051
FIGURE 4
GROUND WATER
OBSERVED RELEASE
TETRA TECH



LEGEND

- 2001 Observed Release Sediment Sample
- 2001 Background Sediment Sample
- 2008 Observed Release Sediment Sample
- 2008 Background Sediment Sample
- Probable Point of Entry
- Kerr-McGee Chemical Corp - Jacksonville Property Boundary
- Concrete Pad
- Fill Area
- Foundation
- Adjacent Structures
- Road Outline

0 150 300 Feet

1:3,600

Note:
Fasco - Florida Agricultural and Supply Company
PPE – Probable point of entry
SC – Sediment core sample
SD – Sediment sample

Source:
Aerial photograph, GlobeXplorer, 1/2008;
Shaw Environmental, Inc. Final Remedial Investigation Report, Figures 1-2 and 2-4, January 2006 (Reference 5);
AECOM, Inc. Additional Sediment Sampling Report, Figure 2-1, December 4, 2008 (Reference 63).
Jacksonville GIS Property Information Website, June 23, 2009 (Reference 9).

United States Environmental Protection Agency

KERR-MCGEE
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DUVAL COUNTY,
FLORIDA
TDD No.TTEMI-05-003-0051

FIGURE 5
SURFACE WATER
OBSERVED RELEASE

TETRA TECH

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74. IT Corporation, Data Package Review, Kerr-McGee, Sample Delivery Group KMGJ09. Prepared by Anthony T. Garcia, Quality Control Manager. April 20, 2001. 14 Pages.

75. IT Corporation, Final RI/FS Work Plan Addendum for Operable Unit-2, Kerr-McGee Chemical LLC Site, Jacksonville, Florida. Prepared for Kerr McGee LLC, Oklahoma City, Oklahoma. Project No. 806578.11010000. February 2001. 94 Pages.

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78. St. Johns River Water Management District. The St. Johns River. Including Map Attachment .April 2008. 3 Pages.

79. Tetra Tech. Project Note to File with Attachments. Subject: Contract Reporting Limits and Sample Specific Reporting Limits for Aqueous and Soil Samples Collected During the Remedial Investigation at the Kerr-McGee Chemical Corp – Jacksonville Facility. July 29, 2009. 10 Pages.

80. Tetra Tech. Project Note to File with Attachment. Subject: Florida Geologic Survey (FGS) Lithologic Well Log Printouts of FGS Wells Within a 2-Mile Radius of Kerr-McGee Chemical Corporation located at 1611 Talleyrand Avenue in Jacksonville, Duval County, Florida. August 21, 2009. 37 Pages.

81. Tetra Tech. Project Note to File with Attachment. Subject: Information Regarding Abandoned Floridan Aquifer Wells at Kerr-McGee Chemical Corp - Jacksonville located at 1611 Talleyrand Avenue in Jacksonville, Duval County, Florida. August 21, 2009. 20 Pages.

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SITE DESCRIPTION

The Kerr-McGee - Jacksonville facility is located at 1611 Talleyrand Avenue in Jacksonville, Duval County, Florida (Ref. 8, p. 1) (see Figure 1 of this Hazard Ranking System [HRS] documentation record). The geographic coordinates as measured from the approximate center of Source No. 1, the backfilled surface impoundment are latitude 30.3442° north and longitude 81.6265° west (Ref. 4, p. 2) (see Figure 1 of this HRS documentation record). The property is 33.217 acres and is currently vacant (Ref. 9, pp. 2, 3; 16, pp. 72, 73). The EPA identification number as recorded in the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database is FLD039049101 (Ref. 10, p. 1). The Kerr-McGee - Jacksonville property is located in a heavily industrialized area in the Port of Jacksonville (Refs. 3; 7, p. 3-1; 11, p. 3; 22, pp. 10, 11). The property is bordered by a Port of Jacksonville Marine Terminal (currently leased by Toyota) to the north, Deer Creek and industrial properties including CSX Railroad and Jones Chemical to the south, the St. Johns River to the east, and Talleyrand Avenue to the west (Refs. 5, p. 1-2, Figure 1-2; 7, p. 3-1, Figure 1-4; 22, pp. 10, 11).

From 1919 until 1970, operations at the Kerr-McGee - Jacksonville property included a pesticide and herbicide formulation plant and a fertilizer and sulfuric acid manufacturing plant (Refs. 11, p. 3; 14, p. 10). The pesticide and herbicide formulation and blending plant also known as the Florida Agricultural Supply Company (Fasco) plant was located on the northwestern portion of the property, and the former fertilizer manufacturing plant was located on the eastern portion of the property (Refs. 11, p. 3; 5, Figure 1-2; 14, p. 4). Sulfuric acid was manufactured in a sulfur plant located in the northeastern corner of the property (Ref. 5, p. 1-3, Figure 1-2; 14, p. 4). Kerr-McGee - Jacksonville also operated a steel drum reconditioning facility near the pesticide storage warehouse. All of the process buildings have been demolished and only their foundations remain on the property (Ref. 11, p. 3). The Kerr-McGee - Jacksonville property is currently vacant (Ref. 9, pp. 2, 3). The property is covered in low vegetation such as native grasses and shrubs, with a small wooded area in the east-central portion of the Kerr-McGee - Jacksonville property (Refs. 5, p. 1-2; 6, p. 1-2; 16, pp.72, 73) (see Figure 2 of this HRS documentation record). The Kerr-McGee - Jacksonville property is fenced and access is restricted by four locked gates, two located along Talleyrand Avenue, one on the southern fence line, and one on the eastern fence line (Ref. 5, p. 1-2).

Two sources have been identified on the Kerr-McGee - Jacksonville property for scoring purposes: Source No. 1, a backfilled surface impoundment located in the northwestern portion of the property, and Source No. 2, contaminated soil located throughout the property (Refs. 5, Figure 2-2, Appendix G, Tables G-1 through G-4) (see Figure 3 of this HRS documentation record).

OPERATIONAL AND REGULATORY HISTORY

The fertilizer manufacturing plant located at the Kerr-McGee - Jacksonville property was constructed by Wilson and Toomer Company in 1919 and was sold to Plymouth Cordage in the late 1950s. The Emhart Corporation acquired the plant from Plymouth Cordage in 1965 and subsequently sold the plant to Kerr-McGee - Jacksonville in 1970. Kerr-McGee - Jacksonville ceased operation of the facility in 1978. From 1919 until 1970, pesticides and herbicides were formulated and fertilizers and sulfuric acid were manufactured at the facility (Ref. 7, p. 2-2; 14, p. 1; 17, p. 1-2).

Production activities at Kerr-McGee - Jacksonville included sulfur grinding, pesticide and solids blending, spraying of insecticides onto dry granule materials, insecticide and fertilizer mixing, pelletizing of herbicide dusts and powders, emulsifying of insecticides and fish oil soap, and the packaging and bottling of products. At the Fasco plant, pesticides were formulated in liquid, dust, granular, and pelletized form. No active pesticide ingredients were manufactured at Kerr-McGee - Jacksonville and residual pesticide wastes were containerized and disposed of in landfills off-site. The fertilizer manufacturing plant at Kerr-McGee - Jacksonville produced superphosphate, a combination of sulfuric acid and ground phosphate rock, and blended agricultural nutrients to form both standard-grade and specialty-grade agricultural fertilizers. Raw materials for the pesticide and fertilizer plant operations were stored inside warehouses on the property. Finished pesticide products were stored in drums until shipped to customers (Refs. 7, p. 2-3; 11, p. 3; 14, p. 1).

The surface impoundment located north of the Fasco building, functioned as a settling basin for wastewater and spills from the liquid pesticide and herbicide formulation units. Wastewater (including process water and wash water from equipment cleaning) and product formulation residues were directed to the surface impoundment (Refs. 7, p. 2-3; 11, p. 3; 14, p. 5; 17, pp. 1-2, 1-3). The Fasco building contained a concrete drainage channel in the floor of the building that ran the length of the building and along the northern side of the pesticide processing units. A sump pit was located near the center of the drainage channel. Wash down water and spills drained into the sump and were then pumped to the surface impoundment (Source No. 1). Clarified water from the surface impoundment was periodically pumped to a dredge/fill pond located in the northern portion of the fertilizer plant. The dredge/fill pond was generally used for drying sediment dredged from the St. Johns River (Refs. 7, p. 2-4; 11, p. 4; 14, pp. 5, 6).

In March 2000, Kerr-McGee - Jacksonville entered into an Administrative Order by Consent (AOC) with EPA for a remedial investigation and feasibility study (RI/FS). The purpose of the RI was to fully determine the nature and extent of the threat to the public health and welfare and/or the environment caused by the release or threatened release of hazardous substances, pollutants, or contaminants at or from the facility into the environment. The purpose of the FS was to develop and evaluate alternatives for remedial action to prevent, mitigate, or otherwise respond to the migration or the release or threatened release of hazardous substances, pollutants, or contaminants from the property (Ref. 11, p. 2).

PREVIOUS INVESTIGATIONS

From 1984 to 1998, several soil, ground water, and sediment investigations were conducted at the Kerr-McGee - Jacksonville property in an effort to characterize the contaminants of concern. These investigations identified metals and pesticides as the primary contaminants of concern.

In August 1998, Ecology and Environment, Inc. (E&E), on behalf of the Florida Department of Protection (FDEP), conducted an expanded site inspection at the Kerr-McGee - Jacksonville property. During this investigation, FDEP identified several possible sources of contamination including a backfilled surface impoundment, various product storage warehouses, former sulfur plant, dredge/fill pond, scrubber sludge disposal pile, and the bulk rail loading and unloading area (Ref. 7, p. 2-3). FDEP conducted soil, ground water, and sediment sampling. Composite surface soil samples collected from the former specialty product warehouse area contained several metals at elevated concentrations, including arsenic, beryllium, chromium, and mercury, among others. The concentration of an analyte is considered elevated if the concentration is greater than or equal to three times the background concentration or greater than or equal to the sample quantitation limit if not detected in the background sample (i.e., meeting observed release or observed contamination criteria). Pesticides, including alpha-chlordane, gamma-chlordane, dichlorodiphenyldichloroethane (DDD), dichlorodiphenyldichloroethylene, p,p- (DDE), Dichlorodiphenyltrichloroethane, 4,4- (DDT), dieldrin, and toxaphene were also detected in surface soil samples at elevated concentrations (Ref. 7, p. 4-1, Tables 4-1 and 5-1, Appendix D). Ground water samples collected from monitoring wells located throughout the property contained arsenic, beryllium, cadmium, chromium, lead, manganese, zinc, alpha- hexachlorocyclohexane (BHC), beta-BHC, gamma-BHC, and toxaphene, among others, at elevated concentrations (Ref. 7, pp. 4-2 and 4-3, Tables 4-

1 and 5-1, Appendix D). Sediment samples collected from Deer Creek and the St. Johns River indicated the presence of arsenic, beryllium, cadmium, chromium, lead, manganese, mercury, zinc, alpha-BHC, beta-BHC, gamma-BHC, alpha-chlordane, gamma-chlordane, DDD, DDE, DDT, dieldrin, and toxaphene, among other hazardous substances (Ref. 7, p. 4-2, Tables 4-1 and 5-2, Appendix D).

Between October 2000 and March 2005, Kerr-McGee - Jacksonville conducted a RI at the Kerr-McGee - Jacksonville property. The RI was conducted as part of the AOC (Refs. 5, pp. 1-1, 1-2; 11). The property was divided into two operable units (OU). OU-1 included all land-based (soil and ground water) portions of the property and OU-2 included sediments in the adjacent St. Johns River (Ref. 5, pp. 1-1, 1-2). Soil samples were collected from 0 to 10 feet below land surface (bls) (Ref. 5, p. 2-5). Stainless steel permanent monitoring wells were installed throughout the Kerr-McGee - Jacksonville property at three depth intervals: shallow (12 to 15 feet bls), intermediate (40 to 45 feet bls), and deep (70 to 75 feet bls) (Ref. 5, p. 2-6). Pesticides and metals were detected in soil and ground water samples collected throughout the property (Ref. 5, Tables 4-2, 4-3, 4-8, Figures 2-2, 2-3).

A lithologic investigation of the backfilled surface impoundment was conducted during the RI. Continuous direct-push soil samples were collected from land surface to a depth of 16 feet bls (Ref. 5, pp. 4-16, 4-17). A layer of green sludge was encountered between 6 and 10 feet bls, and a layer of black sludge was encountered between 12 and 13 feet bls (Ref. 5, p. 4-17, Figures 4-38, 4-39). The maximum concentrations of aldrin, dieldrin, alpha-BHC, beta-BHC, gamma-BHC, DDD, DDE, DDT, endrin, heptachlor, toxaphene, and arsenic in soil samples collected during the RI were detected between 6 and 8 feet bls from boring locations adjacent to the northern, western, and eastern edges of the backfilled surface impoundment (Ref. 5, pp. 4-16, 4-17, Tables 4-2 and 4-3, Figure 2-3). Ground water samples collected in the vicinity of the backfilled surface impoundment indicated the presence of alpha-BHC, beta-BHC, and chlorobenzene at elevated concentrations (Ref. 5, pp. 4-28 through 4-32, 4-39, 4-30, Table 4-8, Figures 2-3, 4-46 through 4-78).

Surface and subsurface soil samples were collected from the dredge/fill pond area. The soil samples contained arsenic, lead, beta-BHC, and dieldrin at elevated concentrations (Ref. 5, pp. 4-15, 4-16, Tables 4-2 and 4-3, Figures 4-1 through 4-30). Ground water samples collected in the vicinity of the dredge/fill pond indicated the presence of alpha-BHC, beta-BHC, gamma-BHC, DDD, dieldrin, chlorobenzene, and manganese at elevated concentrations (Ref. 5, pp. 4-28 through 4-32, 4-39, 4-30, Table 4-8, Figures 4-46 through 4-78, 4-100).

Sediment samples collected from the St. Johns River contained elevated concentrations of pesticides and metals, including DDD, DDT, arsenic, lead, zinc, and mercury (Ref. 5, pp. 4-45 and 4-46, Table 4-9, Figures 4-101 through 4-111).

Various types of surveys were conducted during the RI. In October 2000, a potable well survey identified 47 known potable wells located within 2 miles of the Kerr-McGee - Jacksonville property (Ref. 5, pp. 2-2 and 2-3). A bathymetric survey of the bottom of the St. Johns River within 200 feet of the Kerr-McGee - Jacksonville property was conducted in March 2001 (Ref. 5, p. 2-16). The bathymetric survey included the collection of elevations above mean sea level (amsl) of the top and bottom of the St. Johns River. The elevation readings were used to prepare a contour map depicting contour lines of the water's surface at the Kerr-McGee - Jacksonville property (Ref. 5, pp. 2-16, 2-17, Figure 2-6). In September 2004, a radiological survey was conducted in the vicinity of the former phosphate scrubber sludge pile located near the southeastern corner of the Kerr-McGee - Jacksonville property. Several locations exceeded two times background readings for radioactivity (Ref. 5, p. 2-17). In September and October 2004, a ground-penetrating radar (GPR) survey conducted at the Kerr-McGee - Jacksonville property (Ref. 5, pp. 2-17, 2-18). The GPR survey did not reveal any anomalies that indicated the presence of buried containers (Ref. 5, pp. 4-49, 4-50).

2.2 SOURCE CHARACTERIZATION

2.2.1 SOURCE IDENTIFICATION

Number of Source: 1

Name of Source: Backfilled surface impoundment

Source Type: Backfilled surface impoundment

Description and Location of Source (with reference to a map of the site):

Source No. 1, the backfilled surface impoundment, is located at the northwestern corner of the former pesticide formulation plant building (also known as the Fasco building) at the Kerr-McGee - Jacksonville property (Refs. 13, p. 2; 14, pp. 4, 5, 15). The backfilled surface impoundment was not lined (Refs. 12, p. 3; 14, p. 5). Historical information provided by Kerr-McGee – Jacksonville, indicates that the impoundment was about 100 feet by 100 feet and about 10 feet deep (Ref. 14, p. 5). However, during the May 2002 RI sampling event, Kerr-McGee advanced soil borings within Source No. 1 to determine the limits of the backfilled surface impoundment (Ref. 5, pp. 4-16, 4-17, Figures 4-37, 4-38, and 4-39). Based on information collected during the RI, the dimensions of Source No. 1 were determined to be about 60 feet by 75 feet, and about 13 feet deep (Ref. 5, p. 4-17, Figure 4-37, 4-38, and 4-39). Liquid, dust, granular, and pelletized formulations of pesticides and herbicides were produced at the Fasco plant (Refs. 12, p. 3; 13, p. 2; 14, p. 3). Pesticide formulation consisted of blending active ingredients, which were purchased and shipped to the plant, with inert materials for commercial and consumer use (Refs. 12, p. 3; 14, pp. 1, 3). Some of the active ingredients included, but were not limited to aldrin, chlordane, dieldrin, endrin, BHC, endosulfan, heptachlor, methoxychlor, malathion, and toxaphene (Ref. 14, Appendix A). All liquid pesticide and herbicide products produced at the facility were formulated in the same area of the Fasco plant (Ref. 14, p. 5). Liquid pesticides were blended and bottled in the "Zinoil" units, the Emulsifying unit, the Bottling unit, and the Lime Sulfur unit (Ref. 14, pp. 3, 5). All of these pesticide formulation units were located on the same side of the Fasco building and were in line with each other (Ref. 14, p. 5). Wastewater from the pesticide formulation units was directed to the surface impoundment (Ref. 14, p. 5). A concrete drainage channel (ditch) was located in the floor and ran the length of the building along the north side of the pesticide formulation units (Ref. 14, p. 5). A sump was located in the center of the drainage ditch. All wash down water and spills in the liquid pesticide formulation area drained into the sump and were pumped to the surface impoundment (Refs. 12, p. 3; 13, p. 2; 14, p. 5). Wash down water included water used to clean the liquid pesticide units at the end of each day, and water used to clean equipment when they were changed from one type of pesticide product to another (Ref. 14, p. 6). The surface impoundment was used as a settling pond, and occasionally liquid from the surface impoundment was pumped into the dredge/fill pond located at the fertilizer manufacturing plant, east of the herbicide building (Refs. 13, p. 2; 14, p. 6). When the production schedule was completed on each liquid production unit at Kerr-McGee - Jacksonville, the unit was drained into the surface impoundment (Ref. 14, p. 8). The units were then rinsed with a soda ash and chlorine solution, which was also drained into the surface impoundment (Ref. 14, p. 8). Historical information prepared by Kerr-McGee – Jacksonville indicates that the surface impoundment was filled with soil and closed in place when operations terminated (Ref. 14, p. 6).

In November 1984, Kerr-McGee - Jacksonville collected sludge samples at multiple depths from two borings advanced in the backfilled surface impoundment (Ref. 15, pp. 11, 13, 14, 15, 24). Both borings contained a grey-green silty sludge layer from 6 to 10 feet bls that was believed to be process sludge deposited at the bottom of the surface impoundment (Ref. 15, 13, 14, 15, 24). Analytical results of the soil and sludge samples revealed the presence of chlordane, toxaphene, and DDT (Ref. 15, p. 25, Appendix A, pp. 8, 9).

During the RI, Kerr-McGee – Jacksonville collected a soil sample (KMC-IT-SB-3-10) at 10 feet bls from the backfilled surface impoundment below the sludge layer (Ref. 5, Appendix D, p. 12). Analytical results of the sample collected from Source No. 1 during the RI contain alpha-BHC, beta-BHC, gamma-BHC, alpha-chlordane, gamma-chlordane, endrin, DDD, DDE, and dieldrin (Refs. 5, Figure 2-2; 29, p. 8; 30, p. 63).

2.2.2 HAZARDOUS SUBSTANCES ASSOCIATED WITH THE SOURCE

Background Concentrations

The subsurface soil samples listed in Table 1 were collected in November 2000 during the Kerr-McGee - Jacksonville RI (Ref. 5, p. 2-5, Table 2-4). A background sample was not designated during the RI; therefore, the subsurface soil samples collected from an adjacent property west of the Kerr-McGee - Jacksonville property, samples KMC-IT-SB25-4 and KMC-IT-SB26-4, were selected to represent background conditions for comparison to the sample collected from Source No. 1 because historical information prepared by Kerr-McGee – Jacksonville indicates that the surface impoundment was filled with soil and closed in place when operations terminated (Ref. 5, Figure 2-2; 14, p. 6). Subsurface soil samples KMC-IT-SB25-4 and KMC-IT-SB26-4 were collected at depths of 4 to 5 feet bls (Refs. 5, Appendix D, pp. 21, 39; 29, pp. 9, 10). A background soil sample was not collected from 10 to 11 feet bls; therefore, samples KMC-IT-SB25 and KMC-IT-SB26 were used for comparison. The background subsurface soil samples and the subsurface soil sample collected from Source No. 1 were collected during the same sampling event, in accordance with the same sampling procedures (Refs. 5, pp. 2-1, 2-5, 2-6, 4-16, 4-17, Figure 2-2, Table 2-4; 23, pp. 83, 84, 90, 91; 29).

The background subsurface soil samples were analyzed for arsenic and lead using EPA Method 6010 and pesticides using EPA Method 8081 (Refs. 5, Table 2-5; 31, pp. 1, 3, 4, 6, 7). Sample specific reporting limits were calculated using the laboratory contract reporting limits listed in the final RI/FS sampling plan and subsequent updated reporting limits, and the sample-specific percent solids and dilution factors (Refs. 23, p. 42; 38, pp. 26, 27, 29; 79, pp. 1, 2, 8). The data validation report for the background samples is contained in Reference 43. Field notes are contained in Appendix D of Reference 5 and chain of custody records are contained in Reference 29. The location of the background samples are depicted on Figure 2-2 of Reference 5 (also see Figure 3 of this HRS documentation record).

TABLE 1: Background Soil Samples – October and November 2000 Sampling Events					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration (µg/kg)**	**Sample Specific RLs (µg/kg)**	**References**
KMC-IT-SB25-4	11/09/2000	Alpha-BHC	2.1U	2.1	5, Appendix D, p. 21; 29, p. 9; 31, p. 6; 38, p. 26
KMC-IT-SB25-4	11/09/2000	Beta-BHC	2.1U	2.1	5, Appendix D, p. 21; 29, p. 9; 31, p. 6; 38, p. 26
KMC-IT-SB25-4	11/09/2000	Gamma-BHC	2.1U	2.1	5, Appendix D, p. 21; 29, p. 9; 31, p. 6; 38, p.27
KMC-IT-SB25-4	11/09/2000	Alpha-chlordane	2.1U	2.1	5, Appendix D, p. 21; 29, p. 9; 31, p. 6; 38, p.26
KMC-IT-SB25-4	11/09/2000	Gamma-chlordane	2.1U	2.1	5, Appendix D, p. 21; 29, p. 9; 31, p. 6; 38, p. 26

TABLE 1: Background Soil Samples – October and November 2000 Sampling Events					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration (µg/kg)**	**Sample Specific RLs (µg/kg)**	**References**
KMC-IT-SB25-4	11/09/2000	Endrin	4.1U	4.1	5, Appendix D, p. 21; 29, p. 9; 31, p. 6; 38, p. 27
KMC-IT-SB26-4	11/15/2000	DDD	1.5J (15)	4.1	5, Appendix D, p. 39; 29, p. 10; 31, p. 3; 38, p. 29; 41, p. 8, 16
KMC-IT-SB26-4	11/15/2000	DDE	0.31J (3.1)	4.1	5, Appendix D, p. 39; 29, p. 10; 31, p. 3; 38, p. 29; 41, p. 8, 16
KMC-IT-SB25-4	11/09/2000	Dieldrin	4.1U	4.1	5, Appendix D, p. 21; 29, p. 9; 31, p. 6; 38, p. 26

Notes:

BHC	Hexachlorocyclohexane
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene, p,p-
DDT	Dichlorodiphenyltrichloroethane, 4,4-
ID	Identification
IT	IT Corporation
J	The concentration reported is between the method detection limit and reporting limit. Sample results should be considered estimated with an unknown bias (Reference 31, p. 5). The presence of the analyte is not in doubt. The value presented parenthetically is the concentration obtained by applying EPA fact sheet *Using Qualified Data to Document an Observed Release and Observed Contamination* (November 1996) (Ref. 41)
KMC	Kerr-McGee - Jacksonville
µg/kg	Micrograms per kilogram
RL	Reporting limit
SB	Soil boring
U	Material was analyzed for, but was not detected above the sample specific reporting limit.

Source Concentrations

Subsurface soil sample KMC-IT-SB3-10 listed in Table 2 below was collected from Source No. 1 (backfilled surface impoundment) in October 2000 during the Kerr-McGee – Jacksonville RI (Ref. 5, Appendix D, p. 12, Appendix G, Table G-1, p. 1). The subsurface soil sample was collected at 10 to 11 feet bls (Ref. 5, Table 2-4, p. 1, Table 4-3, p. 1, Figure 2-2, Appendix D, p. 12, Appendix G, Table G-1). The subsurface soil sample was analyzed for arsenic and lead using EPA Method 6010, and pesticides using EPA Method 8081 (Ref. 30, pp. 63, 64). Chain-of-custody records are contained in Reference 29 and field notes are contained in Reference 5, Appendix D, p. 12. Sample specific reporting limits were calculated using the laboratory contract reporting limits listed in the final RI/FS sampling plan and subsequent updated reporting limits, and the sample-specific percent solids and dilution factors (Refs. 23, p. 42; 38, pp. 4, 5; 79, pp. 1, 2, 8). The data validation report is contained in Reference 42. The location of sample KMC-IT-SB3-10 is depicted on Figure 2-2 of Reference 5 (also see Figure 3 of this HRS documentation record).

TABLE 2: Analytical Results for Source No. 1					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration (µg/kg)**	**Sample Specific RL (µg/kg)**	**References**
KMC-IT-SB3-10	10/26/2000	Alpha-BHC	15,000	2,500	5, Appendix D, p. 12; 29, p. 8; 30, p. 63; 38, p. 5
KMC-IT-SB3-10	10/26/2000	Beta-BHC	7,600	2,500	5, Appendix D, p. 12; 29, p. 8; 30, p. 63; 38, p. 5
KMC-IT-SB3-10	10/26/2000	Gamma-BHC	3,000	2,500	5, Appendix D, p. 12; 29, p. 8; 30, p. 63; 38, p. 5
KMC-IT-SB3-10	10/26/2000	Alpha-chlordane	8,000	2,500	5, Appendix D, p. 12; 29, p. 8; 30, p. 63; 38, p. 5
KMC-IT-SB3-10	10/26/2000	Gamma-chlordane	11,000	2,500	5, Appendix D, p. 12; 29, p. 8; 30, p. 63; 38, p. 5
KMC-IT-SB3-10	10/26/2000	Endrin	5,700	4,900	5, Appendix D, p. 12; 29, p. 8; 30, p. 63; 38, p. 5
KMC-IT-SB3-10	10/26/2000	DDD	14,000	4,900	5, Appendix D, p. 12; 29, p. 8; 30, p. 63; 38, p. 4
KMC-IT-SB3-10	10/26/2000	DDE	39,000	4,900	5, Appendix D, p. 12; 29, p. 8; 30, p. 63; 38, p. 4
KMC-IT-SB3-10	10/26/2000	Dieldrin	28,000	4,900	5, Appendix D, p. 12; 29, p. 8; 30, p. 63; 38, p. 5

Notes:

BHC	Hexachlorocyclohexane
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene, p,p-
ID	Identification
IT	IT Corporation
KMC	Kerr-McGee - Jacksonville
μg/kg	Micrograms per kilogram
SB	Soil boring
RL	Reporting limit

2.2.3 HAZARDOUS SUBSTANCES AVAILABLE TO A PATHWAY

From about 1970 to 1978, process wastewater and wash water used to clean equipment on a daily basis from the liquid pesticide formulation units (including the Zinoil, Emulsifying, Bottling, and Lime Sulfur units) at the pesticide formulation plant were discharged into Source No. 1 (the backfilled surface impoundment) (Refs. 12, p. 3; 13, p. 2; 14, pp. 5, 6). When pesticide formulation ceased, the liquid production units in the pesticide formulation plant were drained into the unlined surface impoundment. Also, wash down water consisting of soda ash and chlorine that was generated from cleaning the liquid production units at the time of closure was disposed of in the unlined surface impoundment (Ref. 14, p. 8). Therefore, a containment factor value of 10, as noted in Table 3, was assigned for the ground water migration pathway.

During operations, storm water runoff from the pesticide formulation and fertilizer manufacturing plants discharged to the St. Johns River via drainage ditches on the Kerr-McGee – Jacksonville property (Ref. 14, pp. 4, 5). The RI that Kerr-McGee prepared indicates that the property is currently graded toward an east-west trending low lying area (swale) located in the central portion of the property in the area of the former fertilizer building (Ref. 5, p. 3-4). From the low lying area (swale), runoff is directed eastward to the St. Johns River (Ref. 5, pp. 3-2, 3-4, Figure 3-2). This low lying area is evidenced by the current storm water flow for the Ker-McGee – Jacksonville property (Ref. 5, Figure 3-2). Based on this information, there are no run-on control system or runoff management system are associated with Source 1. Therefore, a containment factor value of 10 as noted in Table 3 was assigned for the surface water migration pathway (Ref. 1, Section 4.1.2.1.2.1.1).

TABLE 3: Containment Factors for Source No. 1

Containment Description	Containment Factor Value	References
Gas release to air	NS	NA
Particulate release to air	NS	NA
Release to ground water: No liner	10	1, Section 3.1.2.1, Table 3-2; 12, p. 3; 14, p. 5
Release via overland migration and/or flood: no run-on control system or runoff management system.	10	1, Section 4.1.2.1.2.1.1; 5, Figure 3-2; 14, pp. 4, 5

Notes:

NA Not applicable
NS Not scored

2.4.2 HAZARDOUS WASTE QUANTITY

2.4.2.1.1 Hazardous Constituent Quantity

The information available is not sufficient to evaluate Tier A, hazardous constituent quantity, as required by Reference 1, Section 2.4.2.1.1.

Hazardous Constituent Quantity Assigned Value: Not scored

2.4.2.1.2 Hazardous Wastestream Quantity

The information available is not sufficient to evaluate Tier B, hazardous wastestream quantity, as required by Reference 1, Section 2.4.2.1.2.

Hazardous Wastestream Quantity Assigned Value: Not scored

2.4.2.1.3 Volume

Based on information provided by Kerr-McGee - Jacksonville, the dimensions of Source No. 1 are about 100 feet by 100, and about 10 feet deep (Ref. 14, p. 5). Therefore, the capacity of Source No. 1 would have been about 100,000 cubic feet (ft^3) or 3,703.70 cubic yards (yd^3). However, during the May 2002 RI sampling event, Kerr-McGee advanced soil borings within Source No. 1 to determine the limits of the backfilled surface impoundment (Ref. 5, pp. 4-16, 4-17, Figures 4-38 and 4-47). Based on information collected during the RI, the dimensions of Source No. 1 were determined to be about 60 feet by 75 feet, and about 13 feet deep (Ref. 5, p. 4-17, Figure 4-37). Using the RI dimensions as a conservative estimate, the volume of Source No. 1 is estimated to be 58,500 ft^3 or 2,166.66 yd^3 (60 x 75 x 13 feet deep).

Sum (yd^3): 2,166.66
Equation for Assigning Value (Ref. 1, Table 2-5): 2,166.66 ÷ 2.5 = 866.66

Volume Assigned Value: 866.66

2.4.2.1.4 Area

The volume of Source No. 1 is provided in Section 2.4.2.1.3; therefore, a value of zero was assigned for area (Ref. 1, Section 2.4.2.1.4).

Area Assigned Value: 0

2.4.2.1.5 Source Hazardous Waste Quantity Value

Highest assigned value assigned from Reference 1, Table 2-5: 866.66

2.2.1 SOURCE IDENTIFICATION

Number of Source: 2

Name of Source: Contaminated Soil Throughout the Kerr-McGee - Jacksonville Property

Source Type: Contaminated Soil

Description and Location of Source (with reference to a map of the site):

Source No. 2 is comprised of contaminated soil located throughout the Kerr-McGee - Jacksonville property. The areas of contaminated soil contain hazardous substances including metals, pesticides, and polychlorinated biphenyls (PCB). Soil sampling conducted during several investigations from 1984 to 2005 at Kerr-McGee - Jacksonville has indicated that areas of contaminated soil are located throughout the entire facility property (Refs. 5, Tables 4-1A, 4-2, 4-3, Appendix G, Tables G-1 through G-4; 18, pp. 10 to 18). Areas of contaminated soil are located in and around the Fasco building foundation, herbicide building, pesticide storage warehouse, northwestern corner of Kerr-McGee - Jacksonville property, a former burn pit, and drum reconditioning areas of the former pesticide formulation plant (Ref. 5, Tables 4-1A, 4-2, and 4-3, Figures 1-2 and 2-2). Areas of contaminated soil are also located in and around former structures of the fertilizer manufacturing plant including the fertilizer storage warehouse and the sulfuric acid plant (Ref. 5, Tables 4-1A, 4-2, and 4-3 and 4-4, Figures 1-2 and 2-2).

Analytical results of surface and subsurface soil samples collected by Kerr-McGee - Jacksonville from October 2000 to September 2004 during the RI indicate the presence of pesticides, including aldrin, alpha-BHC, beta-BHC, total chlordane, DDD, DDE, DDT, dieldrin, heptachlor, heptachlor expoxide, and toxaphene. These pesticides were detected at several locations throughout the Kerr-McGee - Jacksonville property including under the slab of the herbicide building, along the northern property boundary, north and east of the former herbicide building, in the northwestern portion of the Kerr-McGee - Jacksonville property, around the perimeter of the backfilled surface impoundment (Source No. 1), between the former machine shop storeroom foundation pad and the former fertilizer building, south of the Fasco building to the former pesticide storage warehouse, and several other areas in the western half of the property (Refs. 5, pp. 4-15, 4-16, Figures 4-31 and 4-34; 6, Figures 2-4 and 2-6).

Analytical results of surface and subsurface soil samples from October 2000 to September 2004 also indicate the presence of arsenic and lead throughout the entire Kerr-McGee - Jacksonville property. Areas with the highest arsenic and lead concentrations include the middle portion of the property along the long axis, the southwestern and northwestern corners of the property, north of the Fasco building, and under the former herbicide building slab (Refs. 5, p. 4-16, Figures 4-33 and 4-36; 6, Figures 2-5 and 2-7).

Kerr-McGee - Jacksonville Remedial Investigation October and November 2000 Sampling Event

Background Concentrations

The surface and subsurface soil samples listed in Table 4 were collected in November 2000 during the Kerr-McGee - Jacksonville RI (Ref. 5, Table 2-4). Background samples were not designated during the RI; therefore, the surface and subsurface soil samples collected from an adjacent property west of the Kerr-McGee - Jacksonville property that is not impacted by past facility operations were selected to represent background conditions for comparison to samples collected from Source No. 2 (Ref. 5, Figure 2-2). Surface soil samples KMC-IT-SB25-0 and KMC-IT-SB26-0 were collected from land surface to 1 foot bls (Ref. 5, Appendix D, pp. 21, 39). Subsurface soil samples KMC-IT-SB25-4 and KMC-IT-SB26-4 were collected at depths of 4 to 5 feet bls (Refs. 5, Appendix D, pp. 21, 39; 29, pp. 9, 10). The background surface and subsurface soil samples and the surface and subsurface soil samples collected from Source No. 2 were collected during the same sampling event, in accordance with the same sampling procedures, and from the same soil type (Refs. 5, pp. 2-1, 2-5, 2-6, Figure 2-2, Table 2-4; 23, pp. 83, 84, 90, 91; 29; 40, pp. 2, 4).

The background subsurface soil samples were analyzed for arsenic and lead using EPA Method 6010 and pesticides using EPA Method 8081 (Refs. 5, Table 2-5; 31, pp. 1, 8). Sample specific reporting limits were calculated using the laboratory contract reporting limits listed in the final RI/FS sampling plan and subsequent updated reporting limits, and the sample-specific percent solids and dilution factors (Refs. 23, p. 42; 38, pp. 25, 26, 27, 28, 29, 30; 79, pp. 1, 2, 8, 9). The data validation report for the background samples is contained in Reference 43. Field notes are contained in Appendix D of Reference 5 and chain of custody records are contained in Reference 29. The location of the background samples are depicted on Figure 2-2 of Reference 5 (also see Figure 3 of this HRS documentation record).

TABLE 4: Background Soil Samples – October and November 2000 Sampling Events

Sample ID	Date	Hazardous Substance	Hazardous Substance Concentration (µg/kg)	Sample Specific RLs (µg/kg)	References
Surface Soil Samples					
KMC-IT-SB25-0	11/09/2000	Alpha-BHC	1.8U	1.8	5, Appendix D, p. 21; 29, p. 9; 31, p. 8; 38, p. 25
KMC-IT-SB26-0	11/15/2000	Beta-BHC	0.85J (8.5)	1.8	5, Appendix D, p. 39; 29, p. 10; 31, p. 1; 38, p. 28; 41, pp. 8, 16; 58, p. i
KMC-IT-SB25-0	11/09/2000	Gamma-BHC	1.8U	1.8	5, Appendix D, p. 21; 29, p. 9; 31, p. 8; 38, p. 26
KMC-IT-SB25-0	11/09/2000	Alpha-chlordane	1.4J (14)	1.8	5, Appendix D, p. 21; 29, p. 9; 31, p. 8; 38, p. 25; 41, pp. 8, 16; 58, p. i
KMC-IT-SB26-0	11/15/2000	Gamma-chlordane	17	1.8	5, Appendix D, p. 39; 29, p. 10; 31, p. 1; 38, p. 28

TABLE 4: Background Soil Samples – October and November 2000 Sampling Events					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration (µg/kg)**	**Sample Specific RLs (µg/kg)**	**References**
KMC-IT-SB25-0	11/09/2000	DDD	6.5	3.5	5, Appendix D, p. 21; 29, p. 9; 31, p. 8; 38, p. 25
KMC-IT-SB26-0	11/15/2000	DDE	15	3.5	5, Appendix D, p. 39; 29, p. 10; 31, p. 1; 38, p. 27
KMC-IT-SB26-0	11/15/2000	DDT	2.3J (29.48)	3.5	5, Appendix D, p. 39; 29, p. 10; 31, p. 1; 38, p. 27; 41, pp. 8, 16; 58, p. i
KMC-IT-SB26-0	11/15/2000	Dieldrin	1.5J (17.89)	3.5	5, Appendix D, p. 39; 29, p. 10; 31, p. 1; 38, p. 28; 41, p. 8, 16; 58, p. i
KMC-IT-SB25-0	11/09/2000	Endosulfan I	1.8U	1.8	5, Appendix D, p. 21; 29, p. 9; 31, p. 8; 38, p. 25
KMC-IT-SB25-0	11/09/2000	Endosulfan II	3.5U	3.5	5, Appendix D, p. 21; 29, p. 9; 31, p. 8; 38, p. 25
KMC-IT-SB25-0	11/09/2000	Endrin	3.5U	3.5	5, Appendix D, p. 21; 29, p. 9; 31, p. 8; 38, p. 25
KMC-IT-SB25-0	11/09/2000	Endrin aldehyde	3.5U	3.5	5, Appendix D, p. 21; 29, p. 9; 31, p. 8; 38, p. 25
KMC-IT-SB26-0	11/15/2000	Heptachlor	0.61J (4.80)	1.8	5, Appendix D, p. 39; 29, p. 10; 31, p. 1; 38, p. 28; 41, pp. 8, 17; 58, p. i
KMC-IT-SB25-0	11/09/2000	Toxaphene	180U	180	5, Appendix D, p. 21; 29, p. 9; 31, p. 26; 38, p. 26
KMC-IT-SB25-0	11/09/2000	Arsenic	4,600	860	5, Appendix D, p. 21; 29, p. 9; 31, p. 9; 38, p. 26
KMC-IT-SB25-0	11/09/2000	Lead	71,000	540	5, Appendix D, p. 21; 29, p. 9; 31, p. 9; 38, p. 26
Subsurface Soil Samples					
KMC-IT-SB25-4	11/09/2000	Alpha-BHC	2.1U	2.1	5, Appendix D, p. 21; 29, p. 9; 31, p. 6; 38, p. 26

TABLE 4: Background Soil Samples – October and November 2000 Sampling Events					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration (µg/kg)**	**Sample Specific RLs (µg/kg)**	**References**
KMC-IT-SB25-4	11/09/2000	Beta-BHC	2.1U	2.1	5, Appendix D, p. 21; 29, p. 9; 31, p. 6; 38, p. 26
KMC-IT-SB25-4	11/09/2000	Gamma-BHC	2.1U	2.1	5, Appendix D, p. 21; 29, p. 9; 31, p. 6; 38, p. 27
KMC-IT-SB25-4	11/09/2000	Alpha-chlordane	2.1U	2.1	5, Appendix D, p. 21; 29, p. 9; 31, p. 6; 38, p. 26
KMC-IT-SB25-4	11/09/2000	Gamma-chlordane	2.1U	2.1	5, Appendix D, p. 21; 29, p. 9; 31, p. 6; 38, p. 26
KMC-IT-SB26-4	11/15/2000	DDD	1.5J (15)	4.1	5, Appendix D, p. 39; 29, p. 9; 31, p. 3; 38, p. 29; 41, pp. 8, 16; 58, p. i
KMC-IT-SB26-4	11/15/2000	DDE	0.31J (3.1)	4.1	5, Appendix D, p. 39; 29, p. 9; 31, p. 3; 38, p. 29; 41, pp. 8, 16; 58, p. i
KMC-IT-SB25-4	11/09/2000	Dieldrin	4.1U	4.1	5, Appendix D, p. 21; 29, p. 10; 31, p. 6; 38, p. 26
KMC-IT-SB26-4	11/15/2000	Arsenic	1,600	990	5, Appendix D, p. 39; 29, p. 10; 31, p. 4; 38, p. 30
KMC-IT-SB26-4	11/15/2000	Lead	12,000	620	5, Appendix D, p. 39; 29, p. 10; 31, p. 4; 38, p. 30

Notes:

BHC	Hexachlorocyclohexane
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene, p,p-
DDT	Dichlorodiphenyltrichloroethane, 4,4-
ID	Identification
IT	IT Corporation
J	The concentration is estimated, but the presence of the analyte is not in doubt. An explanation of why the concentrations are qualified and their bias can be found in Reference 58. The value presented parenthetically is the concentration obtained by applying EPA fact sheet *Using Qualified Data to Document an Observed Release and Observed Contamination* (November 1996) (Ref. 41)
KMC	Kerr-McGee - Jacksonville

µg/kg	Micrograms per kilogram
RL	Reporting limit
SB	Soil boring
U	Material was analyzed for, but was not detected above the sample specific reporting limit.

Source Concentrations:

The surface and subsurface soil samples listed in Table 5 were collected in October 2000 during the Kerr-McGee - Jacksonville RI (Ref. 5, Table 2-4). The samples were collected from several locations at the former pesticide formulation and fertilizer manufacturing plants at the Kerr-McGee - Jacksonville property (Ref. 5, Figure 2-2). The surface and subsurface soil samples listed in Table 5 were compared to the background surface and subsurface soil samples listed in Table 4. The surface soil samples were collected from 0 to 2 feet bls and the subsurface soil samples were collected from depths greater than 2 feet bls (Ref. 5, Appendix D). The surface and subsurface soil samples were analyzed for arsenic and lead using EPA Method 6010 and pesticides using EPA Method 8081 (Ref. 5, Table 2-5). Logbook notes are contained in Reference 5, Appendix D and chain-of-custody records are contained in Reference 29. Sample specific reporting limits were calculated using the laboratory contract reporting limits listed in the final RI/FS sampling plan and subsequent updated reporting limits, and the sample-specific percent solids and dilution factors (Refs. 23, p. 42; 38, pp. 1, 2, 3, 6, 7, 8 through 24, 63, 64, 65, 79; 79, pp. 1, 2, 8, 9). Analytical results are contained in Reference 30 and data validation reports for the 2000 analytical data packages are contained in Reference 42. The locations of Source No. 2 samples are depicted on Figure 2-2 of Reference 5 (also see Figure 3 of this documentation record).

TABLE 5: Analytical Results for Source No. 2 – October and November 2000 Sampling Events

Sample ID	Date	Hazardous Substance	Hazardous Substance Concentration (µg/kg)	Sample Specific RL (µg/kg)	References
Surface Soil Samples					
KMC-IT-SB2-0	10/26/2000	Alpha-BHC	18,000	1,100	5, Appendix D, p. 13; 29, p. 8; 30, p. 63; 38, p. 2
KMC-IT-SB2-0	10/26/2000	Beta-BHC	7,400	1,100	5, Appendix D, p. 13; 29, p. 8; 30, p. 63; 38, p. 2
KMC-IT-SB2-0	10/26/2000	Gamma-BHC	3,100	1,100	5, Appendix D, p. 13; 29, p. 8; 30, p. 63; 38, p. 3
KMC-IT-SB2-0	10/26/2000	Alpha-chlordane	3,000	1,100	5, Appendix D, p. 13; 29, p. 8; 30, p. 63; 38, p. 2
KMC-IT-SB2-0	10/26/2000	Dieldrin	2,400	2,100	5, Appendix D, p. 13; 29, p. 8; 30, p. 63; 38, p. 2
KMC-IT-SB2-0	10/26/2000	Endrin	3,400	2,100	5, Appendix D, p. 13; 29, p. 8; 30, p. 63; 38, p. 3
KMC-IT-SB2-0	10/26/2000	Endrin aldehyde	3,700	2,100	5, Appendix D, p. 13; 29, p. 8; 30, p. 63; 38, p. 3
KMC-IT-SB2-0	10/26/2000	Toxaphene	190,000	110,000	5, Appendix D, p. 13; 29, p. 8; 30, p. 63; 38, p. 3

TABLE 5: Analytical Results for Source No. 2 – October and November 2000 Sampling Events					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration (µg/kg)**	**Sample Specific RL (µg/kg)**	**References**
KMC-IT-SB4-0	10/24/2000	Beta-BHC	4,300	490	5, Appendix D, p. 7; 29, p. 4; 30, p. 33; 38, p. 79
KMC-IT-SB4-0	10/24/2000	DDD	1,200	960	5, Appendix D, p. 7; 29, p. 4; 30, p. 33; 38, p. 79
KMC-IT-SB4-0	10/24/2000	DDE	1,800	960	5, Appendix D, p. 7; 29, p. 4; 30, p. 33; 38, p. 79
KMC-IT-SB4-0	10/24/2000	DDT	11,000	960	5, Appendix D, p. 7; 29, p. 4; 30, p. 33; 38, p. 79
KMC-IT-SB4-0	10/24/2000	Dieldrin	1,200	960	5, Appendix D, p. 7; 29, p. 4; 30, p. 33; 38, p. 79
KMC-IT-SB5-0	10/24/2000	Alpha-BHC	530,000	40,000	5, Appendix D, p. 6; 29, p. 4; 30, p. 38; 38, p. 8
KMC-IT-SB5-0	10/24/2000	Beta-BHC	200,000	40,000	5, Appendix D, p. 6; 29, p. 4; 30, p. 38; 38, p. 8
KMC-IT-SB5-0	10/24/2000	Alpha-chlordane	92,000	40,000	5, Appendix D, p. 6; 29, p. 4; 30, p. 38; 38, p. 9
KMC-IT-SB5-0	10/24/2000	Gamma-chlordane	96,000	40,000	5, Appendix D, p. 6; 29, p. 4; 30, p. 38; 38, p. 9
KMC-IT-SB5-0	10/24/2000	DDD	250,000	79,000	5, Appendix D, p. 6; 29, p. 4; 30, p. 38; 38, p. 8
KMC-IT-SB5-0	10/24/2000	Heptachlor	63,000	40,000	5, Appendix D, p. 6; 29, p. 4; 30, p. 38; 38, p. 9
KMC-IT-SB7-0	10/25/2000	Alpha-BHC	440,000	39,000	5, Appendix D, p. 10; 29, p. 7; 30, p. 55; 38, p. 11
KMC-IT-SB7-0	10/25/2000	Beta-BHC	110,000	39,000	5, Appendix D, p. 10; 29, p. 7; 30, p. 55; 38, p. 11
KMC-IT-SB7-0	10/25/2000	Gamma-BHC	89,000	39,000	5, Appendix D, p. 10; 29, p. 7; 30, p. 55; 38, p. 12

TABLE 5: Analytical Results for Source No. 2 – October and November 2000 Sampling Events					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration (µg/kg)**	**Sample Specific RL (µg/kg)**	**References**
KMC-IT-SB8-0	10/25/2000	Alpha-BHC	920,000	55,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 55; 38, p. 15
KMC-IT-SB8-0	10/25/2000	Beta-BHC	320,000	55,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 55; 38, p. 15
KMC-IT-SB8-0	10/25/2000	Gamma-BHC	130,000	55,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 55; 38, p. 15
KMC-IT-SB8-0	10/25/2000	Alpha-chlordane	100,000	55,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 55; 38, p. 15
KMC-IT-SB8-0	10/25/2000	Gamma-chlordane	93,000	55,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 55; 38, p. 15
KMC-IT-SB8-0	10/25/2000	DDE	230,000	110,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 55; 38, p. 15
KMC-IT-SB8-0	10/25/2000	Arsenic	75,000	1,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 56; 38, p. 16
KMC-IT-SB8-0	10/25/2000	Lead	320,000	650	5, Appendix D, p. 11; 29, p. 7; 30, p. 56; 38, p. 16
KMC-IT-SB1	10/26/2000	Alpha-BHC	16,000	1,000	5, Appendix D, p. 13; 29, p. 8; 30, p. 66; 38, p. 1
KMC-IT-SB1	10/26/2000	Beta-BHC	5,300	1,000	5, Appendix D, p. 13; 29, p. 8; 30, p. 66; 38, p. 1
KMC-IT-SB1	10/26/2000	Gamma-BHC	2,900	1,000	5, Appendix D, p. 13; 29, p. 8; 30, p. 66; 38, p. 1
KMC-IT-SB1	10/26/2000	Alpha-chlordane	1,700	1,000	5, Appendix D, p. 13; 29, p. 8; 30, p. 66; 38, p. 1
KMC-IT-SB1	10/26/2000	Gamma-chlordane	1,700	1,000	5, Appendix D, p. 13; 29, p. 8; 30, p. 66; 38, p. 1
KMC-IT-SB1	10/26/2000	DDD	6,300	2,000	5, Appendix D, p. 13; 29, p. 8; 30, p. 66; 38, p. 1

TABLE 5: Analytical Results for Source No. 2 – October and November 2000 Sampling Events					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration (µg/kg)**	**Sample Specific RL (µg/kg)**	**References**
KMC-IT-SB1	10/26/2000	DDE	3,000	2,000	5, Appendix D, p. 13; 29, p. 8; 30, p. 66; 38, p. 1
KMC-IT-SB2-1	10/26/2000	Alpha-BHC	18,000	980	5, Appendix D, p. 13; 29, p. 8; 30, p. 63; 38, p. 3
KMC-IT-SB2-1	10/26/2000	Beta-BHC	5,500	980	5, Appendix D, p. 13; 29, p. 8; 30, p. 63; 38, p. 3
KMC-IT-SB2-1	10/26/2000	Gamma-BHC	3,100	980	5, Appendix D, p. 13; 29, p. 8; 30, p. 63; 38, p. 4
KMC-IT-SB2-1	10/26/2000	Alpha-chlordane	2,100	980	5, Appendix D, p. 13; 29, p. 8; 30, p. 63; 38, p. 3
KMC-IT-SB2-1	10/26/2000	Gamma-chlordane	2,700	980	5, Appendix D, p. 13; 29, p. 8; 30, p. 63; 38, p. 3
KMC-IT-SB2-1	10/26/2000	DDD	15,000	1,900	5, Appendix D, p. 13; 29, p. 8; 30, p. 63; 38, p. 3
KMC-IT-SB2-1	10/26/2000	DDE	3,100	1,900	5, Appendix D, p. 13; 29, p. 8; 30, p. 63; 38, p. 3
KMC-IT-SB4-1	10/24/2000	Alpha-BHC	1,700,000	88,000	5, Appendix D, p. 7; 29, p. 4; 30, p. 33; 38, p. 6
KMC-IT-SB4-1	10/24/2000	Alpha-chlordane	100,000	88,000	5, Appendix D, p. 7; 29, p. 4; 30, p. 33; 38, p. 6
KMC-IT-SB4-1	10/24/2000	Gamma-chlordane	110,000	88,000	5, Appendix D, p. 7; 29, p. 4; 30, p. 33; 38, p. 6
KMC-IT-SB4-1	10/24/2000	DDD	360,000	170,000	5, Appendix D, p. 7; 29, p. 4; 30, p. 33; 38, p. 6
KMC-IT-SB4-1	10/24/2000	DDT	590,000	170,000	5, Appendix D, p. 7; 29, p. 4; 30, p. 33; 38, p. 6
KMC-IT-SB4-1	10/24/2000	Arsenic	1,100,000	2,100	5, Appendix D, p. 7; 29, p. 4; 30, p. 34; 38, p. 7

TABLE 5: Analytical Results for Source No. 2 – October and November 2000 Sampling Events					
Sample ID	Date	Hazardous Substance	Hazardous Substance Concentration (µg/kg)	Sample Specific RL (µg/kg)	References
KMC-IT-SB4-1-FD	10/24/2000	Alpha-BHC	310,000	22,000	5, Appendix D, p. 7; 29, p. 5; 30, p. 33; 38, p. 63
KMC-IT-SB4-1-FD	10/24/2000	DDD	62,000	43,000	5, Appendix D, p. 7; 29, p. 5; 30, p. 33; 38, p. 63
KMC-IT-SB4-1-FD	10/24/2000	DDT	200,000	43,000	5, Appendix D, p. 7; 29, p. 5; 30, p. 33; 38, p. 63
KMC-IT-SB4-1-FD	10/24/2000	Arsenic	480,000	1,100	5, Appendix D, p. 7; 29, p. 5; 30, p. 34; 38, p. 64
KMC-IT-SB5-1	10/24/2000	Alpha-BHC	310,000	17,000	5, Appendix D, p. 6; 29, p. 4; 30, p. 33; 38, p. 10
KMC-IT-SB5-1	10/24/2000	Beta-BHC	110,000	17,000	5, Appendix D, p. 6; 29, p. 4; 30, p. 33; 38, p. 10
KMC-IT-SB5-1	10/24/2000	Gamma-BHC	37,000	17,000	5, Appendix D, p. 6; 29, p. 4; 30, p. 33; 38, p. 10
KMC-IT-SB5-1	10/24/2000	Alpha-chlordane	23,000	17,000	5, Appendix D, p. 6; 29, p. 4; 30, p. 33; 38, p. 10
KMC-IT-SB5-1	10/24/2000	DDD	180,000	33,000	5, Appendix D, p. 6; 29, p. 4; 30, p. 33; 38, p. 9
KMC-IT-SB9-1	10/24/2000	Alpha-BHC	3,000	610	5, Appendix D, p. 6; 29, p. 4; 30, p. 26; 38, p. 19
KMC-IT-SB9-1	10/24/2000	Alpha-chlordane	1,100	610	5, Appendix D, p. 6; 29, p. 4; 30, p. 26; 38, p. 19
KMC-IT-SB9-1	10/24/2000	Gamma-chlordane	800	610	5, Appendix D, p. 6; 29, p. 4; 30, p. 26; 38, p. 19
KMC-IT-SB9-1	10/24/2000	DDD	18,000	1,200	5, Appendix D, p. 6; 29, p. 4; 30, p. 26; 38, p. 18
KMC-IT-SB9-1	10/24/2000	DDT	6,800	1,200	5, Appendix D, p. 6; 29, p. 4; 30, p. 26; 38, p. 18

TABLE 5: Analytical Results for Source No. 2 – October and November 2000 Sampling Events					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration (µg/kg)**	**Sample Specific RL (µg/kg)**	**References**
KMC-IT-SB9-1	10/24/2000	Lead	310,000	710	5, Appendix D, p. 6; 29, p. 4; 30, p. 27; 38, p. 20
KMC-IT-SB13	10/24/2000	DDD	75,000	42,000	5, Appendix D, p. 6; 29, p. 4; 30, p. 26; 38, p. 21
KMC-IT-SB13	10/24/2000	Endosulfan I	340,000	22,000	5, Appendix D, p. 6; 29, p. 4; 30, p. 26; 38, p. 22
KMC-IT-SB13	10/24/2000	Endosulfan II	130,000	42,000	5, Appendix D, p. 6; 29, p. 4; 30, p. 26; 38, p. 22
KMC-IT-SB13	10/24/2000	Arsenic	430,000	5,100	5, Appendix D, p. 6; 29, p. 4; 30, p. 27; 38, p. 22
KMC-IT-SB13	10/24/2000	Lead	2,600,000	3,200	5, Appendix D, p. 6; 29, p. 4; 30, p. 27; 38, p. 22
KMC-IT-SB15-1	10/24/2000	Alpha-chlordane	530	50	5, Appendix D, p. 5; 29, p. 4; 38, p. 23
KMC-IT-SB15-1	10/24/2000	Gamma-chlordane	560	50	5, Appendix D, p. 5; 29, p. 4; 30, p. 26; 38, p. 23
KMC-IT-SB15-1	10/24/2000	DDD	320	97	5, Appendix D, p. 5; 29, p. 4; 30, p. 26; 38, p. 22
KMC-IT-SB15-1	10/24/2000	DDE	180	97	5, Appendix D, p. 5; 29, p. 4; 30, p. 26; 38, p. 22
KMC-IT-SB15-1	10/24/2000	Dieldrin	280	97	5, Appendix D, p. 5; 29, p. 4; 30, p. 26; 38, p. 23
KMC-IT-SB23	10/25/2000	DDD	510,000	220,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 50; 38, p. 24
KMC-IT-SB23	10/25/2000	DDT	420,000	220,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 50; 38, p. 24
KMC-IT-SB23	10/25/2000	Endrin aldehyde	380,000	220,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 50; 38, p. 24

TABLE 5: Analytical Results for Source No. 2 – October and November 2000 Sampling Events					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration (µg/kg)**	**Sample Specific RL (µg/kg)**	**References**
KMC-IT-SB23	10/25/2000	Toxaphene	20,000,000	11,000,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 50; 38, p. 25
Subsurface Soil Samples					
KMC-IT-SB7-2	10/25/2000	Alpha-BHC	24,000	1,400	5, Appendix D, p. 10; 29, p. 7; 30, p. 55; 38, p. 12
KMC-IT-SB7-2	10/25/2000	Beta-BHC	8,200	1,400	5, Appendix D, p. 10; 29, p. 7; 30, p. 55; 38, p. 12
KMC-IT-SB7-2	10/25/2000	Gamma-BHC	4,600	1,400	5, Appendix D, p. 10; 29, p. 7; 30, p. 55; 38, p. 13
KMC-IT-SB7-2	10/25/2000	Alpha-chlordane	1,800	1,400	5, Appendix D, p. 10; 29, p. 7; 30, p. 55; 38, p. 12
KMC-IT-SB7-2	10/25/2000	Gamma-chlordane	1,600	1,400	5, Appendix D, p. 10; 29, p. 7; 30, p. 55; 38, p. 12
KMC-IT-SB7-2	10/25/2000	Dieldrin	3,300	2,800	5, Appendix D, p. 10; 29, p. 7; 30, p. 55; 38, p. 13
KMC-IT-SB8-2	10/25/2000	Alpha-BHC	4,300,000	220,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 60; 38, p. 16
KMC-IT-SB8-2	10/25/2000	Beta-BHC	1,300,000	220,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 60; 38, p. 16
KMC-IT-SB8-2	10/25/2000	Gamma-BHC	1,000,000	220,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 60; 38, p. 17
KMC-IT-SB8-2	10/25/2000	Alpha-chlordane	320,000	220,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 60; 38, p. 16
KMC-IT-SB8-2	10/25/2000	Gamma-chlordane	340,000	220,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 60; 38, p. 16
KMC-IT-SB8-2	10/25/2000	DDD	1,000,000	430,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 60; 38, p. 16
KMC-IT-SB8-2	10/25/2000	Arsenic	910,000	6,500	5, Appendix D, p. 11; 29, p. 7; 30, p. 61; 38, p. 17

TABLE 5: Analytical Results for Source No. 2 – October and November 2000 Sampling Events					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration (µg/kg)**	**Sample Specific RL (µg/kg)**	**References**
KMC-IT-SB8-2	10/25/2000	Lead	900,000	4,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 61; 38, p. 17
KMC-IT-SB7-4	10/25/2000	Alpha-BHC	910,000	120,000	5, Appendix D, p. 10; 29, p. 7; 30, p. 55; 38, p. 14
KMC-IT-SB7-4	10/25/2000	Beta-BHC	280,000	120,000	5, Appendix D, p. 10; 29, p. 7; 30, p. 55; 38, p. 14
KMC-IT-SB7-4	10/25/2000	Gamma-BHC	170,000	120,000	5, Appendix D, p. 10; 29, p. 7; 30, p. 55; 38, p. 14
KMC-IT-SB7-4	10/25/2000	DDD	330,000	240,000	5, Appendix D, p. 10; 29, p. 7; 30, p. 55; 38, p. 13
KMC-IT-SB7-4	10/25/2000	Arsenic	120,000	1,200	5, Appendix D, p. 10; 29, p. 7; 30, p. 56; 38, p. 14
KMC-IT-SB7-4-FD	10/25/2000	Alpha-BHC	920,000	59,000	5, Appendix D, p. 10; 29, p. 7; 30, p. 55; 38, p. 64
KMC-IT-SB7-4-FD	10/25/2000	Beta-BHC	300,000	59,000	5, Appendix D, p. 10; 29, p. 7; 30, p. 55; 38, p. 64
KMC-IT-SB7-4-FD	10/25/2000	Gamma-BHC	160,000	59,000	5, Appendix D, p. 10; 29, p. 7; 30, p. 55; 38, p. 65
KMC-IT-SB7-4-FD	10/25/2000	DDD	300,000	110,000	5, Appendix D, p. 10; 29, p. 7; 30, p. 55; 38, p. 64
KMC-IT-SB7-4-FD	10/25/2000	DDE	120,000	110,000	5, Appendix D, p. 10; 29, p. 7; 30, p. 55; 38, p. 64
KMC-IT-SB7-4-FD	10/25/2000	Arsenic	140,000	1,100	5, Appendix D, p. 10; 29, p. 7; 30, p. 56; 38, p. 65
KMC-IT-SB8-4	10/25/2000	Alpha-BHC	2,000,000	96,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 58; 38, p. 17
KMC-IT-SB8-4	10/25/2000	Beta-BHC	470,000	96,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 58; 38, p. 17

TABLE 5: Analytical Results for Source No. 2 – October and November 2000 Sampling Events					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration (µg/kg)**	**Sample Specific RL (µg/kg)**	**References**
KMC-IT-SB8-4	10/25/2000	Gamma-BHC	280,000	96,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 58; 38, p. 18
KMC-IT-SB8-4	10/25/2000	Alpha-chlordane	120,000	96,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 58; 38, p. 17
KMC-IT-SB8-4	10/25/2000	Gamma-chlordane	120,000	96,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 58; 38, p. 18
KMC-IT-SB8-4	10/25/2000	DDD	530,000	190,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 58; 38, p. 17
KMC-IT-SB8-4	10/25/2000	Arsenic	210,000	1,100	5, Appendix D, p. 11; 29, p. 7; 30, p. 59; 38, p. 18
KMC-IT-SB8-4	10/25/2000	Lead	490,000	700	5, Appendix D, p. 11; 29, p. 7; 30, p. 59; 38, p. 18
KMC-IT-SB11-4	10/25/2000	Alpha-chlordane	3,800	800	5, Appendix D, p. 9; 29, p. 6; 30, p. 44; 38, p. 20
KMC-IT-SB11-4	10/25/2000	Gamma-chlordane	4,400	800	5, Appendix D, p. 9; 29, p. 6; 30, p. 44; 38, p. 20
KMC-IT-SB11-4	10/25/2000	DDD	13,000	1,600	5, Appendix D, p. 9; 29, p. 6; 30, p. 44; 38, p. 20
KMC-IT-SB4-5	10/24/2000	Beta-BHC	110	11	5, Appendix D, p. 7; 29, p. 5; 30, p. 33; 38, p. 7
KMC-IT-SB4-5	10/24/2000	Alpha-chlordane	15	11	5, Appendix D, p. 7; 29, p. 5; 30, p. 33; 38, p. 7
KMC-IT-SB4-5	10/24/2000	Gamma-chlordane	15	11	5, Appendix D, p. 7; 29, p. 5; 30, p. 33; 38, p. 7

Notes:

BHC	Hexachlorocyclohexane
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene, p,p-
DDT	Dichlorodiphenyltrichloroethane, 4,4-
FD	Field duplicate
ID	Identification
IT	IT Corporation
KMC	Kerr-McGee - Jacksonville
µg/kg	Micrograms per kilogram
RL	Reporting limit
SB	Soil boring

Kerr-McGee - Jacksonville Remedial Investigation May and June 2002 Sampling Event

Background Concentrations

Surface and subsurface soil samples listed in Table 6 were collected in June 2002 during the Kerr-McGee - Jacksonville RI (Ref. 5, Table 2-4, Appendix G, Table G-1). Background samples were not designated during the RI. Therefore, the surface and subsurface soil samples (samples KMC-IT-SB64-0 and KMC-IT-SB64-4) collected in the southwestern portion of the Kerr-McGee - Jacksonville property from an area of minimal disturbance were selected to represent background conditions for comparison to samples collected from Source No. 2 (Ref. 5, Figure 2-2). Surface soil sample KMC-IT-SB64-0 was collected at a depth of 0 to 1 foot bls (Refs. 5, Table 2-4, Appendix D, p. 52; 29, p. 33). Subsurface soil sample KMC-IT-SB64-4 was collected at a depth of 4 to 5 feet bls (Refs. 5, Table 2-4, Appendix D, p. 52; 29, p. 32). The background surface and subsurface soil samples and the surface and subsurface soil samples collected from Source No. 2 were collected during the same sampling event, in accordance with the same sampling procedures and from the same soil type (Refs. 5, pp. 2-1, 2-5, 2-6, Figure 2-2, Table 2-4; 23, pp. 83, 84, 90, 91; 29; 40, pp. 2, 4). Logbook notes are contained in Reference 5, Appendix D and chain-of-custody records are contained in Reference 29. The locations of the background surface and subsurface soil samples are depicted on Figure 2-2 of Reference 5 (also see Figure 3 of this HRS documentation record).

The background surface and subsurface soil samples were analyzed for arsenic and lead using EPA Method 6010 and pesticides using EPA Method 8081 (Refs. 5, Table 2-5; 32, pp. 53, 55, 77, 79). Sample specific reporting limits were calculated using the laboratory contract reporting limits listed in the final RI/FS sampling plan and subsequent updated reporting limits, and the sample-specific percent solids and dilution factors (Refs. 38, pp. 42, 43, 45, 73; 79, pp. 1, 2, 8, 9). Data validation reports for the May and June 2002 analytical data packages are contained in References 45 and 46.

TABLE 6: Background Soil Samples for May and June 2002 Sampling Events					
Sample ID[1]	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration**	**Sample Specific RL**	**References**
Surface Soil Sample					
KMC-IT-SB64-0 (Duplicate #5)	06/05/2002	Alpha-BHC	2.0U µg/kg	2.0 µg/kg	5, Appendix D, p. 52, Appendix G, Table G-1, p. 16; 29, p. 33; 32, p. 77; 38, p. 43; 41, pp. 8, 16
KMC-IT-SB64-0 (Duplicate #5)	06/05/2002	Beta-BHC	5.3J (53) µg/kg	2.0 µg/kg	5, Appendix D, p. 52, Appendix G, Table G-1, p. 16; 29, p. 33; 32, p. 77; 38, p. 43; 41, pp. 8, 16; 58, p. i
KMC-IT-SB64-0 (Duplicate #5)	06/05/2002	Gamma-BHC	2.0U µg/kg	2.0 µg/kg	5, Appendix D, p. 52, Appendix G, Table G-1, p. 16; 29, p. 33; 32, p. 77; 38, p. 43; 41, pp. 8, 17

TABLE 6: Background Soil Samples for May and June 2002 Sampling Events					
Sample ID[1]	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration**	**Sample Specific RL**	**References**
KMC-IT-SB64-0 (Duplicate #5)	06/05/2002	Gamma-chlordane	3.0µg/kg	2.0 µg/kg	5, Appendix D, p. 52, Appendix G, Table G-1, p. 16; 29, p. 33; 32, p. 77; 38, p. 43
KMC-IT-SB64-0 (Duplicate #5)	06/05/2002	DDD	4.2 µg/kg	3.9 µg/kg	5, Appendix D, p. 52, 5, Appendix G, Table G-1, p. 17; 29, p. 33; 32, p. 77; 38, p. 42
KMC-IT-SB64-0 (Duplicate #5)	06/05/2002	DDE	11 µg/kg	3.9 µg/kg	5, Appendix D, p. 52, Appendix G, Table G-1, p. 16; 29, p. 33; 32, p. 77; 38, p. 43
KMC-IT-SB64-0 (Duplicate #5)	06/05/2002	DDT	12µg/kg	3.9 µg/kg	5, Appendix D, p. 52, Appendix G, Table G-1, p. 16; 29, p. 33; 32, p. 77; 38, p. 43
KMC-IT-SB64-0 (Duplicate #5)	06/05/2002	Dieldrin	2.8J (33.40) µg/kg	3.9 µg/kg	5, Appendix D, p. 52, Appendix G, Table G-1, p. 17; 29, p. 33; 32, p. 77; 38, p. 43; 41, pp. 8, 16; 58, p. i
KMC-IT-SB64-0	06/05/2002	Arsenic	5.6J (9.74) mg/kg	0.93 mg/kg	5, Appendix D, p. 52; 29, p. 33; 32, p. 79; 38, p. 42; 41, pp. 8, 18; 58, pp. i, 10
KMC-IT-SB64-0	06/05/2002	Lead	60J (86.4) mg/kg	0.58 mg/kg	5, Appendix D, p. 52; 29, p. 33; 32, p. 79; 38, p. 42; 41, pp. 8, 18; 58, pp. i, 10
Subsurface Soil Sample					
KMC-IT-SB64-4-RE	06/05/2002	Beta-BHC	9.4J (94) µg/kg	2.9 µg/kg	29, p. 32; 32, p. 53; 38, p. 73; 41, pp. 8, 16; 58, pp. i, 11
KMC-IT-SB64-4-RE	06/05/2002	Alpha-chlordane	2.7J (27) µg/kg	2.9 µg/kg	29, p. 32; 32, p. 53; 38, p. 73; 41, pp. 8, 16; 58, pp, i, 11
KMC-IT-SB64-4-RE	06/05/2002	DDD	13J µg/kg	5.7 µg/kg	29, p. 32; 32, p. 53; 38, p. 73; 41, pp. 8, 16; 58, pp. ii, 11
KMC-IT-SB64-4-RE	06/05/2002	DDE	3.0J (30) µg/kg	5.7 µg/kg	29, p. 32; 32, p. 53; 38, p. 73; 41, pp. 8, 16; 58, pp. i, 11
KMC-IT-SB64-4-RE	06/05/2002	DDT	1.4J (17.94) µg/kg	5.7 µg/kg	29, p. 32; 32, p. 53; 38, p. 73; 41, pp. 8, 16; 58, pp. ii, 11

TABLE 6: Background Soil Samples for May and June 2002 Sampling Events					
Sample ID[1]	Date	Hazardous Substance	Hazardous Substance Concentration	Sample Specific RL	References
KMC-IT-SB64-4	06/05/2002	Arsenic	8.7J (15.13) mg/kg	1.4 mg/kg	29, p. 32; 32, p. 55; 38, p. 45; 41, pp. 8, 18; 58, pp. i, 12
KMC-IT-SB64-4	06/05/2002	Lead	57J (82.08)mg/kg	0.86 mg/kg	29, p. 32; 32, p. 55; 38, p. 45; 41, pp. 8, 18; 58, pp. i, 12

Notes:

1 Samples KMC-IT-SB64-0 and KMC-IT-SB64-4 were reanalyzed. Concentrations presented for samples IDs ending in "RE" are those of the reanalysis.
BHC Hexachlorocyclohexane
DDD Dichlorodiphenyldichloroethane
DDE Dichlorodiphenyldichloroethylene, p,p-
DDT Dichlorodiphenyltrichloroethane, 4,4-
ID Identification
IT IT Corporation
J The concentration is estimated, but the presence of the analyte is not in doubt. An explanation of why the concentrations are qualified and their bias can be found in Reference 58. The value presented parenthetically is the concentration obtained by applying EPA fact sheet *Using Qualified Data to Document an Observed Release and Observed Contamination* (November 1996) (Ref. 41)
KMC Kerr-McGee - Jacksonville
µg/kg Micrograms per kilogram
mg/kg Milligrams per kilogram
RL Reporting limit
SB Soil boring
U Material was analyzed for, but not detected above the sample specific reporting limit.

Source Concentrations

The source surface and subsurface soil samples listed in Table 7 were collected in May and June 2002 during the Kerr-McGee - Jacksonville RI (Ref. 5, Table 2-4). The samples were collected from several locations at the former pesticide formulation and fertilizer manufacturing plants at the Kerr-McGee - Jacksonville property (Ref. 5, Figure 2-2). The source surface and subsurface soil samples listed in Table 7 were compared to the background surface and subsurface soil samples listed in Table 6. The source surface soil samples were collected from 0 to 2 feet bls and the source subsurface soil samples were collected from depths greater than 2 feet bls (Ref. 5, Appendix D). The source surface and subsurface soil samples were analyzed for arsenic and lead using EPA Method 6010, and pesticides using EPA Method 8081 (Ref. 5, Table 2-5). Logbook notes are contained in Reference 5, Appendix D and chain-of-custody records are contained in Reference 29. Sample specific reporting limits were calculated using the laboratory contract reporting limits listed in the final RI/FS sampling plan and subsequent updated reporting limits, and the sample-specific percent solids and dilution factors (Refs. 23, p. 42; 38, pp. 31, 34, 35 through 41, 67, 68, 70; 79, pp. 1, 2, 8, 9). Analytical results are contained in References 32 and 34, and data validation reports for the 2002 analytical data packages are contained in References 45 and 46. The locations of the source surface and subsurface soil samples are provide on Figure 2-2 of Reference 5 (also see Figure 3 of this HRS documentation record).

TABLE 7: Analytical Results for Source No. 2 – May and June 2002 Sampling Events

Sample ID	Date	Hazardous Substance	Hazardous Substance Concentration	Sample Specific RL	References
Surface Soil Samples					
KMC-IT-SB36-0	06/03/2002	Arsenic	1,800 mg/kg	9.3 mg/kg	5, Appendix D, p. 51; 29, p. 29; 32, p. 32; 38, p. 31
KMC-IT-SB36-0	06/03/2002	Lead	350 mg/kg	5.8 µg/kg	5, Appendix D, p. 51; 29, p. 29; 32, p. 32; 38, p. 31
KMC-IT-SB41-0	06/03/2002	Dieldrin	160 µg/kg	41 µg/kg	5, Appendix D, p. 50; 29, p. 29; 32, p. 27; 38, p. 34
KMC-IT-SB41-0	06/03/2002	Arsenic	110 mg/kg	0.99 mg/kg	5, Appendix D, p. 50; 29, p. 29; 32, pp. 28, 29; 38, p. 35
KMC-IT-SB41-0	06/03/2002	Lead	1,400 mg/kg	0.62 mg/kg	5, Appendix D, p. 50; 29, p. 29; 32, pp. 28, 29; 38, p. 35
KMC-IT-SB47-0	05/31/2002	Beta-BHC	15,000 µg/kg	8,400 µg/kg	5, Appendix D, p. 47; 29, p. 26; 32, p. 13; 38, p. 35
KMC-IT-SB47-0	05/31/2002	DDD	150,000 µg/kg	16,000 µg/kg	5, Appendix D, p. 47; 29, p. 26; 32, p. 13; 38, p. 35
KMC-IT-SB47-0	05/31/2002	DDE	40,000 µg/kg	16,000 µg/kg	5, Appendix D, p. 47; 29, p. 26; 32, p. 13; 38, p. 35

TABLE 7: Analytical Results for Source No. 2 – May and June 2002 Sampling Events					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration**	**Sample Specific RL**	**References**
KMC-IT-SB47-0	05/31/2002	DDT	180,000 µg/kg	16,000 µg/kg	5, Appendix D, p. 47; 29, p. 26; 32, p. 13; 38, p. 35
KMC-IT-SB57-0	05/28/2002	Gamma-chlordane	1,100 µg/kg	400 µg/kg	5, Appendix D, p. 120; 29, p. 23; 34, p. 1; 38, p. 70
KMC-IT-SB57-0	05/28/2002	DDD	9,500 µg/kg	770 µg/kg	5, Appendix D, p. 120; 29, p. 23; 34, p. 1; 38, p. 70
KMC-IT-SB57-0	05/28/2002	DDE	3,500 µg/kg	770 µg/kg	5, Appendix D, p. 120; 29, p. 23; 34, p. 1; 38, p. 70
KMC-IT-SB57-0	05/28/2002	DDT	7,100 µg/kg	770 µg/kg	5, Appendix D, p. 120; 29, p. 23; 34, p. 1; 38, p. 70
KMC-IT-SB52-2	05/29/2002	Alpha-BHC	170,000 µg/kg	38,000 µg/kg	5, Appendix D, p. 124; 29, p. 24; 34, p. 10; 38, p. 39
KMC-IT-SB52-2	05/29/2002	Beta-BHC	41,000 µg/kg	38,000 µg/kg	5, Appendix D, p. 124; 29, p. 24; 34, p. 10; 38, p. 39
KMC-IT-SB52-2	05/29/2002	Gamma-BHC	64,000 µg/kg	38,000 µg/kg	5, Appendix D, p. 124; 29, p. 24; 34, p. 10; 38, p. 40
KMC-IT-SB52-2	05/29/2002	DDT	860,000 µg/kg	73,000 µg/kg	5, Appendix D, p. 124; 29, p. 24; 34, p. 10; 38, p. 39
Subsurface Soil Samples					
KMC-IT-SB36-4	06/03/2002	Arsenic	44 mg/kg	1.1 mg/kg	5, Appendix D, p. 51; 29, p. 29; 32, p. 36; 38, p. 33
KMC-IT-SB36-4	06/03/2002	Lead	190 mg/kg	0.71 mg/kg	5, Appendix D, p. 51; 29, p. 29; 32, p. 36; 38, p. 33
KMC-IT-SB41-4	06/03/2002	Arsenic	410 mg/kg	1.1 mg/kg	5, Appendix D, p. 50; 29, p. 29; 32, pp. 28, 29; 38, p. 67
KMC-IT-SB41-4	06/03/2002	Lead	2,100 mg/kg	0.66 mg/kg	5, Appendix D, p. 50; 29, p. 29; 32, pp. 28, 29; 38, p. 67
KMC-IT-SB47-4	05/31/2002	DDD	180,000 µg/kg	43,000 µg/kg	5, Appendix D, p. 47; 29, p. 26; 32, p. 4; 38, p. 36

TABLE 7: Analytical Results for Source No. 2 – May and June 2002 Sampling Events					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration**	**Sample Specific RL**	**References**
KMC-IT-SB47-4	05/31/2002	DDT	56,000 µg/kg	43,000 µg/kg	5, Appendix D, p. 47; 29, p. 26; 32, p. 4; 38, p. 36
KMC-IT-SB50-4	05/31/2002	Beta-BHC	100,000 µg/kg	24,000 µg/kg	5, Appendix D, p. 46; 29, p. 26; 32, p. 1; 38, p. 38
KMC-IT-SB50-4	05/31/2002	Alpha-chlordane	55,000 µg/kg	24,000 µg/kg	5, Appendix D, p. 46; 29, p. 26; 32, p. 1; 38, p. 38
KMC-IT-SB50-4	05/31/2002	DDD	350,000 µg/kg	46,000 µg/kg	5, Appendix D, p. 46; 29, p. 26; 32, p. 1; 38, p. 37
KMC-IT-SB50-4	05/31/2002	DDT	280,000 µg/kg	46,000 µg/kg	5, Appendix D, p. 46; 29, p. 26; 32, p. 1; 38, p. 37
KMC-IT-SB52-6	05/29/2002	DDT	12,000,000 µg/kg	940,000 µg/kg	5, Appendix D, p. 124; 29, p. 24; 34, p. 10; 38, p. 40
KMC-IT-SB53-8	05/28/2002	DDD	1,300,000 µg/kg	570,000 µg/kg	5, Appendix D, p. 120; 29, p. 23; 34, p. 4; 38, p. 67
KMC-IT-SB53-8	05/28/2002	DDE	4,600,000 µg/kg	570,000 µg/kg	5, Appendix D, p. 120; 29, p. 23; 34, p. 4; 38, p. 67
KMC-IT-SB53-13	05/28/2002	DDD	51,000 µg/kg	3,900 µg/kg	5, Appendix D, p. 120; 29, p. 23; 34, p. 4; 38, p. 68
KMC-IT-SB53-13	05/28/2002	DDE	13,000 µg/kg	3,900 µg/kg	5, Appendix D, p. 120; 29, p. 23; 34, p. 4; 38, p. 68

Notes:

BHC	Hexachlorocyclohexane
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene, p,p-
DDT	Dichlorodiphenyltrichloroethane, 4,4-
ID	Identification
IT	IT Corporation
KMC	Kerr-McGee - Jacksonville
µg/kg	Micrograms per kilogram
mg/kg	Milligrams per kilogram
RL	Reporting limit
SB	Soil boring

Kerr-McGee - Jacksonville Remedial Investigation September 2004 Sampling Event

Background Concentrations

Background surface and subsurface soil samples listed in Table 8 were collected in September 2004 during the Kerr-McGee - Jacksonville RI (Ref. 5, Table 2-4). Background samples were not designated during the RI. Therefore, the surface and subsurface soil samples collected in the eastern and southern portions of the Kerr-McGee - Jacksonville property from areas of minimal disturbance were selected to represent background conditions for comparison to samples collected from Source No. 2 (Ref. 5, Figure 2-2). Subsurface soil samples KMC-SEI-SB-135-4 and KMC-SEI-SB-135-8 were collected in the southern portion of the Kerr-McGee - Jacksonville property (Ref. 5, Figure 2-2). Surface soil sample KMC-SEI-SB154-0 was collected at a depth of 0 to 1 foot bls (Refs. 5, Table 2-4; 29, p. 54). Subsurface soil sample KMC-SEI-SB-135-4 was collected at a depth of 4 to 5 feet bls and subsurface soil sample KC-SEI-SB-135-8 was collected at a depth of 8 to 9 feet bls (Refs. 5, Table 2-4, Appendix D, pp. 222; 29, p. 52). The background surface and subsurface soil samples and surface and subsurface soil samples collected from Source No. 2 were collected during the same sampling event, in accordance with the same sampling procedures and from the same soil type (Refs. 5, pp. 2-1, 2-5, 2-6, Figure 2-2, Table 2-4; 23, pp. 83, 84, 90, 91; 29; 40, pp. 2, 4). Logbook notes are contained in Appendix D of Reference 5 and chain-of-custody records are contained in Reference 29. The locations of the background samples are depicted on Figure 2-2 of Reference 5 (also see Figure 3 of this HRS documentation record).

The background surface and subsurface soil samples were analyzed for arsenic and lead using EPA Method 6010, and pesticides using EPA Method 8081 (Refs. 5, Table 2-5; 33, p. 146). Sample specific reporting limits were calculated using the contract reporting limits listed in the analytical data packages and the sample-specific percent solids and dilution factors (Refs. 33, pp. 167, 168; 38, pp. 49, 50, 51, 60, 61, 62; 79, pp. 1, 2, 8, 9). Data validation reports for the September and November 2004 sampling events are contained in References 47 and 51.

TABLE 8: Background Soil Samples for September and November 2004 Sampling Events					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration**	**Sample Specific RL**	**References**
Surface Soil Samples – September 2004					
KMC-SEI-SB154-0	09/17/2004	Alpha-BHC	3.4 µg/kg	2.4 µg/kg	5, Appendix F, p. 246; 29, p. 54; 33, p. 241; 38, p. 61
KMC-SEI-SB154-0	09/17/2004	Beta-BHC	2.2J (22) µg/kg	2.4 µg/kg	5, Appendix F, p. 246; 29, p. 54; 33, p. 241; 38, p. 61; 41, p. 8, 16; 58, pp. i, 14
KMC-SEI-SB154-0	09/17/2004	Gamma-BHC	1.9J (22.40) µg/kg	2.4 µg/kg	5, Appendix F, p. 246; 29, p. 54; 33, p. 241; 38, p. 61; 41, p. 8, 17; 58, pp. i, 14

TABLE 8: Background Soil Samples for September and November 2004 Sampling Events					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration**	**Sample Specific RL**	**References**
KMC-SEI-SB154-0	09/17/2004	DDD	4.1J (41) µg/kg	4.6 µg/kg	5, Appendix F, p. 246; 29, p. 54; 33, p. 241; 38, p. 60; 41, p. 8, 16; 58, pp. i, 14
KMC-SEI-SB154-0	09/17/2004	DDE	7.1 µg/kg	4.6 µg/kg	5, Appendix F, p. 246; 29, p. 54; 33, p. 241; 38, p. 60
KMC-SEI-SB154-0	09/17/2004	DDT	10J (128.2) µg/kg	4.6 µg/kg	5, Appendix F, p. 246; 29, p. 54; 33, p. 241; 38, p. 60; 41, p. 8, 16; 58, pp. i, 14
KMC-SEI-SB154-0	09/17/2004	Dieldrin	0.88J (10.49) µg/kg	4.6 µg/kg	5, Appendix F, p. 246; 29, p. 54; 33, p. 241; 38, p. 61; 41, p. 8, 16; 58, pp. i, 14
KMC-SEI-SB154-0	09/17/2004	Arsenic	12 mg/kg	1.1 mg/kg	5, Appendix F, p. 246; 29, p. 54; 33, p. 240; 38, p. 62
KMC-SEI-SB154-0	09/17/2004	Lead	570 mg/kg	0.69 mg/kg	5, Appendix F, p. 246; 29, p. 54; 33, p. 240; 38, p. 62
Subsurface Soil Samples – September 2004					
KMC-SEI-SB135-4	09/16/2004	Aldrin	1.9U µg/kg	1.9 µg/kg	5, Appendix D, p. 222; 29, p. 52; 33, p. 146; 38, p. 49
KMC-SEI-SB135-4	09/16/2004	Alpha-BHC	1.9U µg/kg	1.9 µg/kg	5, Appendix D, p. 222; 29, p. 52; 33, p. 146; 38, p. 49
KMC-SEI-SB135-4	09/16/2004	Dieldrin	3.7U µg/kg	3.7 µg/kg	5, Appendix D, p. 222; 29, p. 52; 33, p. 146; 38, p. 49
KMC-SEI-SB135-4	09/16/2004	Lead	32 mg/kg	0.56 mg/kg	5, Appendix D, p. 222; 29, p. 52; 33, p. 146; 38, p. 50
KMC-SEI-SB135-8	09/16/2004	Alpha-BHC	2.2U µg/kg	2.2 µg/kg	5, Appendix D, p. 222; 29, p. 52; 33, p. 146; 38, p. 50
KMC-SEI-SB135-8	09/16/2004	Gamma- BHC	2.2U µg/kg	2.2 µg/kg	5, Appendix D, p. 222; 29, p. 52; 33, p. 146; 38, p. 51

TABLE 8: Background Soil Samples for September and November 2004 Sampling Events					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration**	**Sample Specific RL**	**References**
KMC-SEI-SB135-8	09/16/2004	Alpha-chlordane	4.1J (41) µg/kg	2.2 µg/kg	5, Appendix D, p. 222; 29, p. 52; 33, p. 146; 38, p. 50; 41, p. 8, 16; 58, pp. i, 13
KMC-SEI-SB135-8	09/16/2004	DDD	5.9U µg/kg	4.2 µg/kg	5, Appendix D, p. 222; 29, p. 52; 33, p. 146; 38, p. 50; 58, pp. ii, 14
KMC-SEI-SB135-8	09/16/2004	DDE	6.8 µg/kg	4.2 µg/kg	5, Appendix D, p. 222; 29, p. 52; 33, p. 146; 38, p. 50
KMC-SEI-SB135-8	09/16/2004	DDT	4.2U µg/kg	4.2 µg/kg	5, Appendix D, p. 222; 29, p. 9; 33, p. 146; 38, p. 50; 41, p. 16; 58, pp. ii, 14

Notes:

BHC	Hexachlorocyclohexane
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene, p,p-
DDT	Dichlorodiphenyltrichloroethane, 4,4-
ID	Identification
J	The concentration is estimated, but the presence of the analyte is not in doubt. An explanation of why the concentrations are qualified and their bias can be found in Reference 58. The value presented parenthetically is the concentration obtained by applying EPA fact sheet *Using Qualified Data to Document an Observed Release and Observed Contamination* (November 1996) (Ref. 41)
KMC	Kerr-McGee - Jacksonville
µg/kg	Micrograms per kilogram
mg/kg	Micrograms per kilogram
RL	Reporting limit
SEI	Shaw Environmental, Inc.
U	Material was analyzed for, but was not detected above the sample specific reporting limit.

Source Concentrations

The source surface and subsurface soil samples listed in Table 9 were collected in September and November 2004 during the Kerr-McGee - Jacksonville RI (Ref. 5, Table 2-4). The samples were collected from several locations at the former pesticide formulation and fertilizer manufacturing plants at the Kerr-McGee - Jacksonville property (Ref. 5, Figure 2-2). The source surface and subsurface soil samples listed in Table 9 were compared to the background surface and subsurface soil samples listed in Table 8. The source surface soil samples were collected from 0 to 2 feet bls and the subsurface soil samples were collected from depths greater than 2 feet bls (Ref. 5, Appendix D). The surface and subsurface soil samples were analyzed for arsenic and lead using EPA Method 6010, and pesticides using EPA Method 8081 (Ref. 5, Table 2-5). Logbook notes are contained in Reference 5, Appendix D and chain-of-custody records are contained in Reference 29. Sample specific reporting limits were calculated using the contract reporting limits listed in the analytical data packages and the sample-specific percent solids and dilution factors (Refs. 33, pp. 22, 39, 136, 167, 168, 187, 228, 263, 300, 301; 38, pp. 45, 46, 47, 48, 49, 51, 52, 53, 54, 56, 58, 59, 60, 74, 75, 76, 77, 79; 79, pp. 1, 2, 8, 9). Data validation reports for the September and November 2004 sampling events are contained in References 47 and 51. The locations of the source surface and subsurface soil samples are depicted on Figure 2-2 of Reference 5 (see Figure 3 of this HRS documentation record).

TABLE 9: Analytical Results for Source No. 2 – September and November 2004 Sampling Events					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration**	**Sample Specific RL**	**References**
Surface Soil Samples					
KMC-SEI-SB116-0	09/16/2004	Beta-BHC	3,700 µg/kg	1,700 µg/kg	5, Appendix D, p. 218; 29, p. 51; 33, p. 207; 38, p. 45
KMC-SEI-SB117-0	09/16/2004	DDD	93,000 µg/kg	7,900 µg/kg	5, Appendix D, p. 218; 29, p. 51; 33, p. 206; 38, p. 46
KMC-SEI-SB117-0	09/16/2004	DDE	17,000 µg/kg	2,000 µg/kg	5, Appendix D, p. 218; 29, p. 51; 33, p. 206; 38, p. 46
KMC-SEI-SB117-0	09/16/2004	DDT	110,000 µg/kg	7,900 µg/kg	5, Appendix D, p. 218; 29, p. 51; 33, p. 206; 38, p. 46
KMC-SEI-SB140-0	09/20/2004	Dieldrin	380 µg/kg	350 µg/kg	5, Appendix D, p. 232; 29, p. 55; 33, p. 244; 38, p. 56
KMC-SEI-SB141-0	09/23/2004	Arsenic	180 mg/kg	1.1 mg/kg	5, Appendix D, p. 241; 29, p. 59; 33, p. 281; 38, p. 58

TABLE 9: Analytical Results for Source No. 2 – September and November 2004 Sampling Events					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration**	**Sample Specific RL**	**References**
KMC-SEI-SB143-0	11/04/2004	DDE	75 µg/kg	4.4 µg/kg	5, Appendix D, p. 169; 29, p. 73; 38, p. 76; 50, p. 35
KMC-SEI-SB143-0	11/04/2004	Dieldrin	200 µg/kg	88 µg/kg	5, Appendix D, p. 169; 29, p. 73; 38, p. 77; 50, p. 35
KMC-SEI-SB143-0	11/04/2004	Arsenic	190 mg/kg	1.1 mg/kg	5, Appendix D, p. 169; 29, p. 73; 38, p. 77; 50, p. 36
KMC-SEI-SB143-0	11/04/2004	Lead	1,400 mg/kg	0.67 mg/kg	5, Appendix D, p. 169; 29, p. 73; 38, p. 77; 50, p. 36
KMC-SEI-SB151-0	09/16/2004	Arsenic	500 mg/kg	1.1 mg/kg	5, Appendix D, p. 226; 29, p. 71; 33, p. 177; 38, p. 60
KMC-SEI-SB151-0	09/16/2004	Lead	3,100 mg/kg	0.67 mg/kg	5, Appendix D, p. 226; 29, p. 71; 33, p. 177; 38, p. 60
KMC-SEI-SB152-0	09/17/2004	Dieldrin	120 µg/kg	21 µg/kg	5, Appendix D, p. 167; 29, p. 54; 33, p. 238; 38, p. 74
KMC-SEI-SB136-1	09/17/2004	Alpha-BHC	16,000 µg/kg	2,700 µg/kg	5, Appendix D, p. 167; 29, p. 55; 33, p. 241; 38, p. 52
KMC-SEI-SB136-1	09/17/2004	Gamma-BHC	5,000 µg/kg	2,700 µg/kg	5, Appendix D, p. 167; 29, p. 55; 33, p. 241; 38, p. 52
KMC-SEI-SB136-1	09/17/2004	DDD	3,000,000 µg/kg	530,000 µg/kg	5, Appendix D, p. 167; 29, p. 55; 33, p. 241; 38, p. 51
KMC-SEI-SB136-1	09/17/2004	DDT	3,000,000 µg/kg	530,000 µg/kg	5, Appendix D, p. 167; 29, p. 55; 33, p. 241; 38, p. 52

TABLE 9: Analytical Results for Source No. 2 – September and November 2004 Sampling Events					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration**	**Sample Specific RL**	**References**
KMC-SEI-SB137-1	09/17/2004	Alpha-BHC	590,000 µg/kg	130,000 µg/kg	5, Appendix D, p. 167; 29, p. 55; 33, p. 244; 38, p. 53
KMC-SEI-SB137-1	09/17/2004	DDD	350,000 µg/kg	260,000 µg/kg	5, Appendix D, p. 167; 29, p. 55; 33, p. 244; 38, p. 53
KMC-SEI-SB137-1	09/17/2004	DDT	1,200,000 µg/kg	260,000 µg/kg	5, Appendix D, p. 167; 29, p. 55; 33, p. 244; 38, p. 53
KMC-SEI-SB139-1	09/17/2004	Dieldrin	250 µg/kg	100 µg/kg	29, p. 55; 33, p. 244; 38, p. 54
Subsurface Soil Samples					
KMC-SEI-SB123-3	11/04/2004	Dieldrin	450 µg/kg	81 µg/kg	5, Appendix D, p. 169; 29, p. 73; 38, p. 75; 50, p. 35
KMC-SEI-SB125-3	09/15/2004	Lead	1,500 mg/kg	0.63 mg/kg	5, Appendix D, p. 209; 29, p. 49; 33, p. 124; 38, p. 49
KMC-SEI-SB141-3	09/23/2004	Lead	1,900 mg/kg	0.62 mg/kg	5, Appendix D, p. 241; 29, p. 59; 33, p. 281; 38, p. 59
KMC-SEI-SB143-3	11/04/2004	Lead	1,900 mg/kg	0.61 mg/kg	5, Appendix D, p. 169; 29, p. 73; 38, p. 79; 50, p. 36
KMC-SEI-SB120-7	09/20/2004	Alpha-BHC	100,000 µg/kg	18,000 µg/kg	29, p. 54; 33, p. 238; 38, p. 48
KMC-SEI-SB120-7	09/20/2004	Gamma-BHC	65,000 µg/kg	18,000 µg/kg	29, p. 54; 33, p. 238; 38, p. 48
KMC-SEI-SB120-7	09/20/2004	Alpha-chlordane	36,000 µg/kg	18,000 µg/kg	29, p. 54; 33, p. 238; 38, p. 48
KMC-SEI-SB120-7	09/20/2004	DDD	160,000 µg/kg	36,000 µg/kg	29, p. 54; 33, p. 238; 38, p. 47
KMC-SEI-SB120-7	09/20/2004	DDT	280,000 µg/kg	36,000 µg/kg	29, p. 54; 33, p. 238; 38, p. 48

Notes:

BHC	Hexachlorocyclohexane
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene, p,p-
DDT	Dichlorodiphenyltrichloroethane, 4,4-
ID	Identification
KMC	Kerr-McGee - Jacksonville
µg/kg	Micrograms per kilogram
mg/kg	Milligrams per kilogram
RL	Reporting limit
SB	Soil boring
SEI	Shaw Environmental, Inc.

2.2.3 HAZARDOUS SUBSTANCES AVAILABLE TO A PATHWAY

Historical evidence indicates releases of pesticides and pesticide components to the surficial aquifer beneath the facility property (Refs. 12, Table 3-2, Figure 2-1; 13, pp. 4, 5, Exhibit IV; 18, pp. 18, 19, 20, 21, 22) (see Section 2.2.2 of this HRS documentation record). Logbooks documenting the collection of soil samples within Source No. 2 do not document the presence of a liner below Source No. 2 (Ref. 5, Appendix D). This information, applied to Table 3-2 in Reference 1, yields a containment value of 10.

During operations, storm water runoff from the pesticide formulation and fertilizer manufacturing plants discharged to the St. Johns River via drainage ditches on the Kerr-McGee – Jacksonville property (Ref. 14, pp. 4, 5). The RI that Kerr-McGee prepared indicates that the property is currently graded toward an east-west trending low lying area (swale) located in the central portion of the property in the area of the former fertilizer building (Ref. 5, p. 3-4). From the low lying area (swale), runoff is directed eastward to the St. Johns River (Ref. 5, pp. 3-2, 3-4, Figure 3-2). This low lying area is evidenced by the current storm water flow for the Ker-McGee – Jacksonville property (Ref. 5, Figure 3-2). Based on this information, there are no run-on control system or runoff management system are associated with Source 2. Therefore, a containment factor value of 10 as noted in Table 10 was assigned for the surface water migration pathway (Ref. 1, Section .1.2.1.2.1.1).

TABLE 10: Containment Factors for Source No. 2

Containment Description	Containment Factor Value	References
Gas release to air	NS	NA
Particulate release to air	NS	NA
Release to groundwater: No liner	10	1, Section 3.1.2.1, Table 3-2; 5, Appendix D
Release via overland migration and/or flood: no run-on control system or runoff management system.	10	1, Section 4.1.2.1.2.1.1; 5, Figure 3-2; 14, pp. 4, 5

Notes:

NA Not applicable
NS Not scored

2.4.2 HAZARDOUS WASTE QUANTITY

2.4.2.1.1 Hazardous Constituent Quantity

The information available is not sufficient to evaluate Tier A, hazardous constituent quantity, as required by Reference 1, Section 2.4.2.1.1.

Hazardous Constituent Quantity Assigned Value: NS

2.4.2.1.2 Hazardous Wastestream Quantity

The information available is not sufficient to evaluate Tier B, hazardous wastestream quantity, as required by Reference 1, Section 2.4.2.1.2.

Hazardous Wastestream Quantity Assigned Value: NS

2.4.2.1.3 Volume

The information available is not sufficient to evaluate Tier C, volume, as required by Reference 1, Section 2.4.2.1.3.

Volume Assigned Value: 0

2.4.2.1.4 Area

Source No. 2 is considered to be the contaminated soil located throughout the Kerr-McGee - Jacksonville property. It is not known if all areas between sampling points are contaminated. Therefore, the area of Source No. 2 is undetermined, but greater than zero (Ref. 1, Section 2.4.2.1.4).

Sum (ft^2): Undetermined but greater than 0
Equation for Assigning Value (Ref. 1, Table 2-5): Area (A)/34,000

Area Assigned Value: >0

2.4.2.1.5 Source Hazardous Waste Quantity Value

Highest assigned value assigned from Reference 1, Table 2-5: >0

SUMMARY OF SOURCE DESCRIPTIONS

TABLE 11: Summary of Source Descriptions						
			Containment Factor Value by Pathway			
					Air	
Source No.	Source Hazardous Waste Quantity Value	Source Hazardous Constituent Quantity Complete? (Yes/No)	Ground Water (Ref. 1, Table 3-2)	Surface Water Overland/ Flood (Ref. 1, Table 4-2)	Gas (Ref. 1, Table 6-3)	Particulate (Ref. 1, Table 6-9)
1	866.66	No	10	10	NS	NS
2	>0	No	10	10	NS	NS

Notes:

>	Greater than
No.	Number
NS	Not scored

Description of Other Possible Sources:

Other sources of concern are present at the facility. However, insufficient information is available to evaluate the other possible sources. The sources include, but are not limited to, the following:

- Additional areas of contaminated soil on the south side of the former superphosphate plant, where the scrubber sludge from the superphosphate scrubber was piled (Ref. 14, p. 11, Figure 2). Alpha chlordane, gamma chlordane, DDT, dieldrin, heptachlor, and heptachlor expoxide have been detected in this area (Ref. 5, Figure 2-2, Appendix G, Table G-1).
- The dredge/fill pond is located in the northeastern portion of the former fertilizer manufacturing plant at Kerr-McGee - Jacksonville (Refs. 13, p. 2; 14, p. 11; 21, p. 25). The dredge/fill pond was a topographically low area on the Kerr-McGee - Jacksonville property that was used as a drying area for sediment that was dredged from the loading dock area on the St. Johns River (Refs. 14, pp. 4, 11; 17, p. 1-2; 21, p. 25). During operations, the dredge/fill pond was also used as a surface impoundment and occasionally received liquid from the pesticide surface impoundment (Source No. 1) (Refs. 13, p. 2; 14, pp. 4, 6, 11; 21, p. 25). DDD, DDT, and endrin ketone have been detected in the dredge/fill pond area (Refs. 5, Figure 2-2, Appendix G, Table G-1; 15, p. 23).

3.0 GROUND WATER MIGRATION PATHWAY

3.0.1 GENERAL CONSIDERATIONS

Duval County lies within five physiographic subdivisions of the Coastal Plain Province: Atlantic Coastal Ridge, Center Park Ridge, Trail Ridge, Eastern Valley, and Duval Uplands. The majority of Duval County is in the Eastern Valley, while the southwestern portion of the county lies in the Trail Ridge and Duval Uplands physiographic features; the Atlantic beaches lie in the Atlantic Coastal Ridge (Ref 24, p. 2-4; 25, p. D8). The Kerr McGee - Jacksonville property lies within the Eastern Valley. These features are the result of primary deposition and subsequent erosion. Ridges are composed of sand that accumulated as beaches and offshore bars on the terraces of the Eastern Valley, and are characterized by thick sand sections at comparatively high land surface elevations (Ref. 24, p. 3, 4; 25 p. D6, D8, D9). The elevation at the Kerr McGee – Jacksonville property is about 5 feet above msl (Ref. 3).

Geologic units the underlie the area, in descending stratigraphic order, include: post-Miocene deposits; the Hawthorn Group (consisting of the Coosawhatchee, Marks Head, and Penney Farms Formations); the Ocala Group; and the Avon Park, Oldsmar, and Cedar Keys Formations (Refs. 25, Tables 2 and 3; 26, p. B-58, Plate 2; 61, pp. 330-332; 68, p. 19). The post-Miocene deposits include sediments of the Holocene and Pleistocene are mapped together (Refs. 25, Table 2; 26, p. B-38; 27, p. 20). Post-Miocene deposits consist of a basal sequence overlain by alluvial and terrace deposits. These deposits consist of sand, gravel, clay, shells, limestone, and marl, and can range from 10 to 200 feet in Duval County, Florida. However, these deposits are about 100 to 120 feet thick near the St. Johns River in central Duval County (Refs. 25, Table 2; 26, p. B-38; 27, p. 20; 53, p. 1-1; 56, pp. 18-19). Other well logs within 2 miles of Kerr-McGee – Jacksonville indicate that the thickness of the post-Miocene deposits may range from 140 to 180 feet (Refs. 80, pp. 2, 8, 30). The Coosawhatchee Formation of the Hawthorn Group consists of quartz sands, dolostone, and clays (Ref. 68, p. 41). The Marks Head Formation of the Hawthorn Group consists of interbedded sands, clays, and dolostone (Ref. 68, p. 21). The Penny Farms Formation of the Hawthorn Group consists of carbonated units, with interbedded sand and clays (Ref. 68, p. 34). The thickness of the Hawthorn Group in the Jacksonville area ranges from about 250 to 500 feet (Refs. 25, Plate 6; 27, pp. 20-21; 53, p. 1-1; 56, p. 18). In Jacksonville Electric Authority (JEA) Municipal Supply Well No. 5406, located about 2.2 miles east-southeast of the Kerr-McGee – Jacksonville property, the Hawthorne Group (upper confining unit) was documented to be 425 feet in thickness (Ref. 53, pp. 1-1 through 1-, 2-2, Figure 2-1).

The Ocala Group can be divided into two parts based on lithology: the upper part consists of coarse-grained limestone, and the lower part consists of fine-grained soft limestone (Ref. 26, p. B-30). The total thickness of the Ocala Group in the Jacksonville area is about 400 feet (Ref. 26, Plates 2 and 9). The Avon Park Formation consists of locally micritic, pelletal limestone and is about 800 feet thick (Ref. 26, p. B-25, B-26). The Oldsmar Formation consists of micritic to finely pelletal limestone, interbedded with fine to medium crystalline, commonly vuggy dolomite, and is about 400 feet thick (Ref. 26, p. B-22, Plate 5). The Cedar Keys Formation can also be divided into two parts based on lithology. The upper one-third of the Cedar Keys Formation consists of coarsely crystalline dolomite that is moderately to highly porous. The lower two-thirds of the Cedar Keys Formation consist of finely crystalline to microcrystalline dolomite interbedded with anhydrite (Ref. 26, pp. B-18). The Cedar Keys Formation is about 500 feet thick in the Jacksonville area (Ref. 26, p. B-58).

Two major sources of ground water exist in the Jacksonville area, a surficial aquifer and the underlying Floridan Aquifer system. The surficial aquifer is in the permeable units of the post-Miocene deposits, and ground water in the surficial aquifer is generally under unconfined conditions (Ref. 25, p. D-17, D-18).

However, some shallow wells located in low areas adjacent to the St. Johns River and its tributaries can yield water under artesian conditions. These local artesian conditions are caused by confining units in the shell and limestone beds near the base of the deposits (Ref. 56, p. 21). The water level in the surficial aquifer fluctuates seasonally, corresponding to variations in precipitation and evaporation (Ref. 25, p. D-18; 56, p. 21). The surficial aquifer is recharged primarily by the infiltration of precipitation that falls in the area and is generally hydrologically interconnected with water from lakes, streams, and marshes (Refs. 25, p. D-18; 27, p. 30). In the Jacksonville area, the elevation of the potentiometric surface of the Floridan Aquifer system is higher than the elevation of the water table. As a result, the surficial aquifer may also be recharged by upward leakage from the Floridan Aquifer system (Refs. 25, p. D-18; 27, p. 31). Water from the shallow aquifer is primarily used for domestic purposes, particularly in rural areas not serviced by private or public utilities (Ref. 27, pp. 1, 46). In the vicinity of the Kerr-McGee – Jacksonville property, regional ground water flow is to the east-southeast (Refs. 3; 24, p. 7; 27, p. 25, 27). The surficial aquifer is separated from the Floridan Aquifer system by the confining beds of the Hawthorn Group (Ref. 25 p. D-18). Throughout most of northeast Florida, the clays and silty clays of the Hawthorn serve as a confining unit that retard the movement of water from the underlying artesian Floridan Aquifer. However, in parts of eastern Duval County, coarse- to very coarse-grained pebbly sand within the Hawthorn is tapped by wells that product about 20 gallons of water per minute (Ref. 27, p. 21).

The Floridan Aquifer system consists of permeable units of the Ocala Group and the Avon Park, Oldsmar, and Cedar Keys Formations (Ref. 26, p. B-47). In the Jacksonville area, the top of the Floridan Aquifer system is at approximately 500 feet bls (Ref. 25, Plate 2; 26, Plate 26). In northeast Florida, the Floridan Aquifer system is divided into the Upper and Lower Floridan Aquifers (Ref. 25, p. D-17). The Upper Floridan Aquifer was encountered at depths between 525 and 680 feet bls in JEA Municipal Supply Well No. 5406 located about 2.2 miles east-southeast of the Kerr-McGee – Jacksonville property (Ref. 53, p. 1-4). Other well logs within 2 miles of the Kerr-McGee – Jacksonville property show the bottom of the Hawthorn Group and top of the Upper Floridan Aquifer between 515 and 540 feet bls (Ref. 80, pp. 3, 8, 13, 14, 30). The middle semi-confining unit underlies the Upper Floridan Aquifer and consists mostly of an upper bed within the Avon Park Formation (Ref. 25, p. D-27, Table 2; 53, p. 1-4). This semi-confining unit is breached by fractures that allow ground water to flow from the Lower to the Upper Floridan Aquifer (Ref. 25, p. D22). The middle semi-confining unit extends between 680 feet and at least 963 feet in JEA Municipal Supply Well No. 5406, with continuation to 1,100 feet likely in this area (Ref. 53, p. 1-4). JEA Well No. 5406 supplies to the Arlington Water Treatment Plant (Ref. 53, p. 1-1). The upper permeable zone of the Lower Floridan Aquifer was encountered at a depth of approximately 1,100 feet in other wells located closer to the Arlington Water Treatment Plant (Ref. 53, Figure 1-2, pp. 1-3, 1-4). JEA Well No. 5405 is 1,117 feet deep, and is located about 1.8 miles east-southeast of Kerr-McGee – Jacksonville (Refs. 3; 54, p. 5). Nine of the wells in the JEA Main Street Wellfield range in depth from 1,276 to 1,319 feet bls. Those wells are cased to about 501 to 532 feet bls, with open boreholes below the casing (Ref. 54, pp. 2, 3). The nine Main Street wells are located between 1.2 and 2 miles west and southwest of the Kerr-McGee – Jacksonville property (Ref. 3). Based on the depth to the Upper (about 500 feet bls) and Lower Floridan (about 1,100 feet bls) Aquifers, the nine Main Street Wells withdraw water from both the Upper and Lower Floridan Aquifers. Also, in the Jacksonville area, the middle semi-confining unit is breached by faults or fractures that might facilitate leakage, generally from the Lower to the Upper Floridan Aquifer (Refs. 25, p. D22; 83, page 19, Figure 9). While there is evidence to suggest that the Upper and the Lower Floridan aquifers are interconnected at a regional level, documentation of interconnection within 2 miles of the sources has not been confirmed at this time.

The Lower Floridan aquifer is composed primarily of permeable beds within the Avon Park, Oldsmar, and Cedar Keys Formations. Reports of occurrence of the Lower Floridan aquifer in the Jacksonville area vary. Reference 25 reports an approximate thickness of 500 feet in the Jacksonville area, lying about 950 to 1,400 feet bls (excluding the Fernandina permeable zone, the base of which is at approximately 2,400-

2,500 feet bls in the Jacksonville area). The JEA Municipal Supply Well No. 5406 drilling report (Reference 53) suggests that the top of the Lower Floridan aquifer occurs at approximately 1,100 feet bls and extends to approximately 2,400 feet (Ref. 25, pp. D-22, D-23, Table 2, Plates 3 and 4; 53, p. 1-4). Although regionally only about 10% of the water extracted from the Floridan aquifer system originates from the Lower Floridan aquifer, this unit, including the Fernandina permeable zone, is a major water source for the Jacksonville area and it supplies about half of the water to municipal and industrial wells (Ref. 25, pp. D22 and D54). Portions of the Lower Floridan aquifer which overlay the Fernandina permeable zone consist of relatively discrete permeable intervals of hard, fractured, limestone or dolomite, separated by various thicknesses of relatively impermeable carbonate rocks (Ref. 53, p. 1-4). The Fernandina permeable zone was encountered from 1,800 to 2,400 feet bls in municipal wells located at the Arlington Water Treatment Plant located approximately 2 miles southeast of the Kerr McGee property (Ref. 53, p. 1-4).

Ground water in the Floridan Aquifer system occurs in joints, faults, bedding planes, and other secondary porosity openings. These openings can become enlarged in carbonate rocks through solution by circulating ground water (Refs. 25, p. D-25; 64). Throughout the vicinity of Jacksonville, Florida, this represents karst ground water flow (Refs. 24, pp. 3, 5, 6; 25, pp. D-21, through D-25). Therefore, karstic ground water flow occurs in the Floridan Aquifer system (Upper and Lower Floridan aquifers) within the entire 4-mile radius from the Kerr-McGee – Jacksonville site sources. However, because of the thickness of the Hawthorn Group, sinkholes have not developed in the Jacksonville area (Refs. 64; 68, Plates 2 and 13).

The principal recharge area of the Floridan Aquifer system in Florida occurs southwest of Jacksonville in portions of western Putnam and Clay Counties and eastern Alachua and Bradford Counties. This recharge area occurs outside of the 4-mile radius of the Kerr-McGee – Jacksonville property. Water recharges the Floridan Aquifer system by three means: (1) through breaches in the confining layers caused by sinkholes; (2) by downward leakage where the confining layers are thin or absent; and (3) directly where the aquifer system is exposed at the surface (Ref. 56, pp. 33).

Several permanent monitoring wells are located at the Kerr-McGee – Jacksonville property (Ref. 5, Figure 1-3). Monitoring wells completed in the shallow aquifer at the Kerr McGee property range in depth from 12 to 75 feet bls (Ref. 5, Table 2-1). The wells were installed at three depths or zones including shallow, 12 to 15 feet bls; intermediate, 40 to 45 feet bls; and deep, 70 to 75 bls (Ref. 5, p. 2-6, Table 2-1). Lithologic logs of the permanent monitoring wells indicate the presence of sand, silty sand, clay, and limestone in the subsurface (Ref. 5, Appendix E). Potentiometric surface maps prepared based on ground water elevations collected during monitoring well sampling activities indicate that the direction of ground water flow in the three zones of the surficial aquifer are as follows: shallow, east-southeast; intermediate, east-southeast; and deep, north, northeast. Ground water flow in the deep zone is more influenced by regional features than the shallow and intermediate zones, which are influenced by local features such as the St. Johns River and Deer Creek (Ref. 5, pp. 3-7, 3-8, Figures 3-6 through 3-14). An artesian (Floridan Aquifer) well was located at the Kerr-McGee – Jacksonville property. Little information is available for this well. The depth of well was about 643 feet bls. The well was abandoned in January 2004 (Ref. 5, p. 2-13).

SUMMARY OF AQUIFERS BEING EVALUATED

TABLE 12: Summary of Aquifers Being Evaluated					
Aquifer No.	**Aquifer Name**	**Is Aquifer Interconnected with Upper Aquifer within 2 miles? (Yes/No/NA)**	**Is Aquifer Continuous within 4-mile TDL? (Yes/No)**	**Is Aquifer Karst? (Yes/No)**	**References**
1	Surficial aquifer	NA	Yes	No	27, p. 20
2	Upper Floridan aquifer	No	Yes	Yes	25, pp. D-3 and D-25, Plates 5 and 6; 64; 53, p. 1-4, Figure 2-1
3	Lower Floridan aquifer	No	Yes	Yes	25, p. D-3, D22, D-25; 53, p. 1-4, Figure 2-1; 64

Notes:

NA Not applicable
TDL Target distance limit

3.1 LIKELIHOOD OF RELEASE

3.1.1 OBSERVED RELEASE

Aquifer Being Evaluated: Surficial aquifer

Chemical Analysis

Kerr McGee Remedial Investigation – October 2004 Sampling Event

Background Samples

The background monitoring well ground water samples listed in Table 13 were collected in October 2004 during the Kerr-McGee - Jacksonville RI (Ref. 5, p. 1-1, Table 2-6, Figure 2-3). Ground water monitoring wells at the Kerr McGee property are completed in three zones of the surficial aquifer (Ref. 5, p. 2-6). Monitoring wells MW-20T and MW-22T are completed in the shallow zone of the surficial aquifer with total depths of 12 to 13 feet bls, and screened intervals of 2 to 13 feet bls (Ref. 5, Table 2-1, p. 5, Figure 2-3, Appendix K, pp. 34, 35, 37). Monitoring well MW-22TD is completed in the intermediate zone of the surficial aquifer at a depth of 45 feet bls and screened intervals of 40 to 45 feet bls (Ref. 5, Table 2-1, p. 5, Figure 2-3, Appendix K, p. 38). Monitoring well MW-11TVD is completed in the deep zone of the surficial aquifer at a depth of 75 feet bls and a screened interval of 70 to 75 feet bls (Ref. 5, Table 2-1, p. 3, Figure 2-3, Appendix K, p. 22). Monitoring wells MW-20T, MW-22T, and MW-22TD were selected to represent background conditions in the shallow and intermediate zones of the surficial aquifer because ground water in the shallow and intermediate zones of the surficial aquifer flows to the southeast; therefore, those wells are located upgradient of ground water underlying Source Nos. 1and 2 at the Kerr McGee property (Refs. 5, Figures 3-9 and 3-13; 6, Figures 2-1 and 2-2). Monitoring well MW-11TDV was selected to represent background conditions in the deep zone of the surficial aquifer because ground water in the deep zone of the surficial aquifer flows to the north; therefore, MW-11TVD is located upgradient of ground water underlying the sources at the Kerr McGee property (Refs. 5, Figure 3-14; 6, Figure 2-3). Also, the background ground water wells were selected based on water level data collected during well installation and sampling activities conducted during the RI. This data is presented in Table 2-2 and on Figures 3-9, 3-13, and 3-14 of Reference 5.

The ground water samples collected from the background monitoring wells and the ground water samples collected from monitoring wells located in the vicinity of and downgradient of sources at the Kerr McGee property were collected using similar sampling procedures from permanent monitoring wells completed in the surficial aquifer with similar construction details, depths, and screened intervals (Ref. 5, pp. 2-1, 2-6, through 2-12, Table 2-1, pp. 1 through 5, Appendix K, pp. 2 through 5, 8, 10 through 14, 17, 22, 23, 25, 34 through 38; 23, pp. 5-2 through 5-9).

The ground water samples were collected in accordance with the final RI/FS sampling plan (Ref. 5, p. 5-2 through 5-9). Well development and purge logs are contained in Reference 5, Appendix I. All wells were sampled after the turbidity was less than or equal to 10 nephelometric turbidity units (NTU) or after the well was purged dry (Ref. 5, Appendix I, pp. 75, 89, 90, 92). Chain of custody records are provided in Reference 29, pp. 62, 70, 79, and logbook notes are provided in Reference 5, Appendix D, pp. 157, 166, 176. The locations of the background monitoring wells listed in Table 13 are provided in Reference 5, Figure 2-3.

TABLE 13: Background Ground Water Samples					
Sample ID (KMC-SEI-)	**Depth (feet bls)**	**Screened Interval (feet bls)**	**Date Sampled**	**Location**	**References**
Background Ground Water Samples – Shallow Monitoring Wells					
MW-20T	13	3 to 12	10/28/2004	West side of Talleyrand Avenue, across from northwestern corner of the Kerr McGee property	5, Table 2-1, p. 5, Figure 2-3, Appendix K, p. 34; 6, Figure 1-3
MW-22T	13	3 to 13	10/28/2004	Southwestern corner of Jaxport property, northwest of the Fasco building foundation	5, Table 2-1, p. 5, Figure 2-3, Appendix K, p. 37; 6, Figure 1-3
Background Ground Water Sample – Intermediate Monitoring Wells					
MW-22TD	45	40 to 45	10/28/2004	Southwestern corner of Jaxport property, northwest of the Fasco building foundation	5, Table 2-1, p. 5, Figure 2-3, Appendix K, p. 38; 6, Figure 1-3
Background Ground Water Sample – Deep Monitoring Wells					
MW-11TVD	75	70 to 75	10/13/2004	Southern portion of Kerr McGee property, near southeast corner of the former specialty product warehouse	5, Table 2-1, p. 3, Figure 2-3, Appendix K, p. 22; 6, Figure 1-3

Notes:

bls Below land surface
ID Identification
KMC Kerr McGee Chemical Corporation
MW Monitoring well
SEI Shaw Environmental, Inc.
T Shallow monitoring well (total depth between 12 and 13 feet bls)
TD Intermediate monitoring well (total depth of 45 feet bls)
TVD Deep monitoring well (total depth of 75 feet bls)

Background Concentrations

The background ground water samples listed in Table 14 were collected in October 2004 the RI conducted on behalf of Kerr McGee (Ref. 5, p. 1-1, Table 2-6, Figure 2-3). The monitoring well ground water samples were analyzed for metals using EPA Method 6010B and pesticides using EPA Method 8081 (Ref. 5, Tables 2-5 and 2-6). Analytical data results are provided in Reference 36. The data validation reports are provided in Reference 48. Sample specific reporting limits were calculated using the laboratory contract reporting limits and the sample-specific dilution factors (Refs. 36, pp. 73, 97, 98, 295, 296, 321, 322; 39, pp. 4 through 9; 79, pp. 1, 2, 6).

TABLE 14: Background Ground Water Concentrations				
Sample ID (KMC-SEI-)	Hazardous Substance	Concentration (µg/L)	Sample Specific RL (µg/L)	References
Background Concentrations – Shallow Monitoring Wells				
MW-20T	Alpha-BHC	0.019J (0.19)	0.050	36, p. 295; 39, p. 5; 41, pp. 8, 16; 48, pp. 121 to 139
MW-20T	Beta-BHC	0.050U	0.050	36, p. 295; 39, p. 6
MW-20T	Gamma-chlordane	0.050U	0.050	36, p. 295; 39, p. 6
MW-20T	DDD	0.0037J (0.037)	0.10	36, p. 295; 39, p. 5; 41, pp. 8, 16; 48, pp. 121 to 139
MW-22T	Arsenic	12	10	36, p. 296; 39, p. 7
MW-22T	Lead	2.5J (3.27)	5	36, p. 296; 39, p. 7; 41, pp. 8, 16; 48, pp. 121 to 139
Background Concentrations – Intermediate Monitoring Wells				
MW-22-TD	Beta-BHC	0.050U	0.050	36, p. 295; 39, p. 7
MW-22TD	Arsenic	6.1J (8.23)	10	36, p. 296; 39, p. 8; 41, pp. 8, 16; 48, pp. 121 to 139
MW-22TD	Lead	5.0U	5	36, p. 296; 39, p. 8
Background Concentrations – Deep Monitoring Wells				
MW-11TVD	Arsenic	10U	10	36, p. 73; 39, p. 4
MW-11TVD	Lead	5.0U	5	36, p. 73; 39, p. 4

Notes:

µg/L Micrograms per liter
BHC Hexachlorocyclohexane
DDD Dichlorodiphenyldichloroethane
ID Identification

J	Estimated value. Concentrations reported between the method detection limit and the reporting limit. Sample results should be considered estimated with an unknown bias (Ref. 48, pp. 121 to 139). The presence of the analyte is not in doubt. The value presented parenthetically is the concentration obtained by applying EPA fact sheet *Using Qualified Data to Document an Observed Release and Observed Contamination* (November 1996) (Ref. 41)
KMC	Kerr McGee Chemical Corporation
MW	Monitoring well
RL	Reporting limit
SEI	Shaw Environmental, Inc.
T	Shallow monitoring well (total depth between 12 and 20 feet bls)
TD	Intermediate monitoring well (total depth between 33 and 48 feet bls)
TVD	Deep monitoring well (total depth 75 feet bls)
U	Compound was analyzed for, but not detected

Contaminated Samples

The contaminated monitoring well ground water samples listed in Table 15 were collected in October 2004 during the Kerr-McGee RI (Ref. 5, p. 1-1, Table 2-6, Figure 2-3). Monitoring wells MW-1T, MW-2T, MW-4T, MW-6T, MW-7T, MW-9T, and MW-12T are completed in the shallow zone of the surficial aquifer with total depths of 12 to 17 feet bls, and screened intervals of 2 to 17 feet bls (Ref. 5, Table 2-1, pp. 1, 2, 3, Figure 2-3, Appendix K, pp. 2, 4, 8, 10, 12, 17, 23). Monitoring wells MW-1TD, MW-2TD, MW-7TD, and MW-12TD are completed in the intermediate zone of the surficial aquifer at a depth of 40 to 48 feet bls and screened intervals of 35 to 48 feet bls (Ref. 5, Table 2-1, pp. 1, 2, Figure 2-3, Appendix K, pp. 3, 5, 11, 13, 24). Monitoring well MW-12TVD is completed in the deep zone of the surficial aquifer at a depth of 75 feet bls and a screened interval of 70 to 75 feet bls (Ref. 5, Table 2-1, pp. 1, 2, Figure 2-3, Appendix K, pp. 5, 14). Monitoring wells MW-1T, MW-1TD, MW-2T, MW-2TD, MW-4T, MW-7T, MW-7TD, MW-9T, MW-12, and MW-12TVD are completed in areas underlying and downgradient of ground water flow from Source Nos. 1 and 2 at the Kerr McGee property (Ref. 5, Figure 2-3). The locations of the monitoring wells listed in Table 15 are provided in Reference 5, Figure 2-3.

Ground water samples collected from the contaminated monitoring wells and the ground water samples collected from the background monitoring wells listed in Table 14 were collected using similar sampling procedures from permanent monitoring wells completed in the surficial aquifer with similar construction details, depths, and screened intervals (Ref. 5, p. 2-1, 2-6 through 2-12, Table 2-1, pp. 1 through 5, Appendix K, pp. 2 through 5, 8, 10 through 14, 17, 22, 23, 25, 34 through 38). All wells were sampled after the turbidity was less than or equal to 10 NTU or after the well was purged dry (Ref. 5, Appendix I, pp. 72, 76, 77, 79, 80, 82, 83, 84, 86, 87). Chain of custody records are provided in Reference 29, pp. 60 to 66 and field documentation is provided in Reference 5, Appendix D, pp. 155 to 160, 163.

TABLE 15: Contaminated Ground Water Samples

Sample ID (KMC-SEI-)	Depth (feet bls)	Screened Interval (feet bls)	Date Sampled	Location	References
Contaminated Ground Water Samples – Shallow Monitoring Wells					
MW-1T	12	2 to 12	10/13/2004	At the northeastern corner of the former fertilizer building pad	5, Table 2-1, p. 1, Figure 2-3, Appendix D, p. 158, Appendix K, p. 2; 6, Figure 1-3; 29, p. 62
MW-4T	12	2 to 12	10/27/2004	Northeast of Source No. 1, and north of herbicide building foundation	5, Table 2-1, p. 1, Figure 2-3, Appendix D, p. 163, Appendix K, p. 8; 6, Figure 1-3; 29, p. 66
MW-7T	12	2 to 12	10/26/2004	Northwest of the Fasco building foundation	5, Table 2-1, p. 2, Figure 2-3, Appendix D, p. 160, Appendix K, p. 12; 6, Figure 1-3; 29, p. 65
MW-9T	13	3 to 13	10/26/2004	At southwestern corner of former specialty product warehouse	5, Table 2-1, p. 2, Figure 2-3, Appendix D, p. 160, Appendix K, p. 17; 6, Figure 1-3; 29, p. 64

TABLE 15: Contaminated Ground Water Samples					
Sample ID (KMC-SEI-)	**Depth (feet bls)**	**Screened Interval (feet bls)**	**Date Sampled**	**Location**	**References**
MW-12T	17	7 to 17	10/26/2004	North of former fertilizer plant storage warehouse	5, Table 2-1, p. 3, Figure 2-3, Appendix D, p. 160, Appendix K, p. 23; 6, Figure 1-3; 29, p. 65
Contaminated Ground Water Samples – Intermediate Monitoring Wells					
MW-1TD	40	35 to 40	10/13/2004	At the northeastern corner of the former fertilizer building pad	5, Table 2-1, p. 1, Figure 2-3, Appendix D, p. 158, Appendix K, p. 3; 6, Figure 1-3; 29, p. 62
MW-2TD	48	43 to 48	10/14/2004	East of the former sulfuric acid plant	5, Table 2-1, p. 1, Figure 2-3, Appendix D, p. 157, 158, Appendix K, p. 5; 6, Figure 1-3; 29, p. 63
MW-7TD	46	41 to 46	10/14/2004	Northwest of the Fasco building foundation	5, Table 2-1, p. 2, Figure 2-3, Appendix K, p. 13; 6, Figure 1-3; 29, p. 63
MW-12TD	46	41 to 46	10/14/2004	North of former fertilizer plant storage warehouse	5, Table 2-1, p. 2, Figure 2-3, Appendix D, p. 159, Appendix K, p. 24; 6, Figure 1-3; 29, p. 66
Contaminated Ground Water Samples – Deep Monitoring Wells					
MW-12TVD	75	70 to 75	10/12/2004	North of former fertilizer plant storage warehouse	5, Table 2-1, p. 3, Figure 2-3, Appendix K, p. 25; 6, Figure 1-3; 29, p. 61

Notes:

bls Below land surface
FD Field duplicate
ID Identification
KMC Kerr McGee Chemical Corporation
MW Monitoring well
SEI Shaw Environmental, Inc.
T Shallow monitoring well (total depth between 12 and 17 feet bls)
TD Intermediate monitoring well (total depth between 40 and 48 feet bls)
TVD Deep monitoring well (total depth of 75 feet bls)

Contaminated Concentrations

The contaminated ground water samples listed in Table 16 were collected in October 2004 during the Kerr- McGee RI (Ref. 5, p. 1-1, Table 2-6, Figure 2-3). The monitoring well ground water samples were analyzed for metals using EPA Method 6010B and pesticides using EPA Method 8081 (Ref. 5, Tables 2-5 and 2-6). Analytical data sheets are provided in Reference 36. The data validation reports are provided in Reference 48. Sample specific reporting limits were calculated using the laboratory contract reporting limits and the sample-specific dilution factors (Refs. 36, pp. 39, 62, 63, 72, 73, 97, 98, 109, 110, 140, 141, 156, 170, 224, 225, 254, 255, 277, 278; 39, pp. 1 through 5, 9, 10, 11, 12, 14, 15; 79, pp. 1, 2, 6).

TABLE 16: Contaminated Concentrations				
Sample ID (KMC-SEI-)	**Hazardous Substance**	**Concentration (µg/L)**	**Sample Specific RL (µg/L)**	**References**
Contaminated Concentrations – Shallow Monitoring Wells				
MW-1T	Beta-BHC	0.13	0.050	36, p. 72; 39, p. 1
MW-1T	Arsenic	490	10	36, p, 73; 39, p. 1
MW-2T	Beta-BHC	0.056	0.050	36, p. 109; 39, p. 9
MW-2T	Arsenic	56	10	36, p. 110; 39, p. 10
MW-4T	Alpha-BHC	310	100	36, p. 170; 39, p. 2
MW-4T	Beta-BHC	40	10	36, p. 170; 39, p. 2
MW-7T	Beta-BHC	1	0.050	36, p. 254; 39, p. 11
MW-7T	Gamma-chlordane	0.14	0.050	36, p. 254; 39, p. 11
MW-7T	DDD	0.27	0.10	36, p. 254; 39, p. 11
MW-9T	DDD	0.14	0.10	36, p. 156; 39, p. 2
MW-9T	Arsenic	44	10	36, p. 157; 39, p. 3
MW-12T	Alpha-BHC	150	25	36, p. 254; 39, p. 5
MW-12T	DDD	3.4	1	36, p. 254; 39, p. 4
MW-12T	Arsenic	1,700	10	26, p. 255; 39, p. 5
Contaminated Concentrations – Intermediate Monitoring Wells				
MW-1TD	Arsenic	62	10	36, p. 73; 39, p. 9
MW-1TD	Lead	20	5	36, p. 73; 39, p. 9
MW-2TD	Arsenic	54	10	36, p. 110; 39, p. 11
MW-2TD	Lead	14	5	36, p. 110; 39, p. 11
MW-7TD	Beta-BHC	0.053	0.25	36, p. 109; 39. p. 12

TABLE 16: Contaminated Concentrations				
Sample ID (KMC-SEI-)	**Hazardous Substance**	**Concentration (µg/L)**	**Sample Specific RL (µg/L)**	**References**
MW-12TD	Arsenic	200	10	36, p. 181; 39, p. 15
Contaminated Concentrations – Deep Monitoring Wells				
MW-12TVD	Arsenic	34	10	36, p. 39; 39, p. 14
MW-12TVD	Lead	6	5	36, p. 39; 39, p. 14

Notes:

µg/L Micrograms per liter
BHC Hexachlorocyclohexane
DDD Dichlorodiphenyldichloroethane
ID Identification
KMC Kerr McGee Chemical Corporation
MW Monitoring well
RL Reporting limit
SEI Shaw Environmental, Inc.
T Shallow monitoring well (total depth between 12 and 20 feet bls)
TD Intermediate monitoring well (total depth between 33 and 48 feet bls)
TVD Deep monitoring well (total depth 75 feet bls)

Attribution:

Kerr McGee operated a pesticide formulation plant and a fertilizer manufacturing plant at the property located at 1611 Talleyrand Avenue in Jacksonville, Florida, from June 1970 until 1978 (Refs. 13, p. 2; 14, p. 1; 7, p. 1).

Pesticide formulation operations consisted of pesticide blending and distribution (Ref. 14, p. 1). All active ingredients were purchased and blended with inert ingredients for the production of commercial pesticide products and distribution to customers (Ref. 14, pp. 1, 3). Pesticides were formulated at the facility in liquid, dust, granular, and pelletized forms (Ref. 14, p. 3). The pesticide production (Fasco) plant was divided into departments based on the form of pesticide produced (Ref. 14, p. 3). The departments for producing liquid pesticides were as follows: "Zinoil" unit; emulsifier unit; lime/sulfur unit, and small bottling unit (Ref. 14, p. 3). Pesticide dusts were produced in the following units: new sulfur plant; old sulfur plant; blenders #1, #2, #3; small package unit, and the J.B. Mill (Ref. 14, p. 3). Granular pesticide formulation took place inside the herbicide department, and the small package unit (Ref. 14, p. 3). Pelletized pesticides were also produced within the herbicide department (Ref. 14, p. 3).

Numerous pesticides were purchased for use at the pesticide formulation (Fasco) plant. Some of these pesticides included: chlorpyrifos, endosulfan, methoxychlor, dieldrin, methylparathion, endrin, ethylparathion, toxaphene, heptachlor, aldrin, atrazine, BHC, lindane (gamma-BHC) chlordane petroleum derivative solvents and DDT among others (Refs. 14, Appendix A; 19, pp. 3, 4, 5). Formulated pesticides were packaged at the facility prior to wholesale distribution (Ref. 14, p. 3).

Fertilizers were also blended at the Kerr McGee property (Ref. 14, p. 9). The only types of fertilizers produced at the facility were dry and pulverized, granular, and semi-granular in form (Ref. 14, p. 9). Raw materials used in fertilizer formulation included the following: anhydrous ammonia, ammonium nitrate, ammonium phosphate, potassium nitrate, superphosphate, phosphate rock, sulfur, sulfuric acid, potash, borax, manganese, iron sulfate, copper sulfate, zinc sulfate, urea, ammonium chloride, calcium carbonate, calcium nitrate, calcium sulfate, potassium chloride, potassium sulfate, and sodium nitrate (Refs. 14, Appendix B; 19, p. 6).

Analytical results of soil samples collected from Source Nos. 1 and 2 from October 2000 to December 2004 during the Kerr-McGee - Jacksonville RI contained elevated concentrations of several raw product pesticides including endrin, endosulfan, dieldrin, DDT, toxaphene, heptachlor, alpha-BHC, and beta-BHC. Arsenic and lead were detected in Source Nos. 1 and 2 (Ref. 5, Appendix G, Tables G1 through G4) (also see Section 2.0 of this HRS documentation record). Analytical results of samples collected from Source 1 by Kerr-McGee in 1984 as deep as 13.5 to 15 feet bls contained chlordane, DDE, DDD, DDT, and toxaphene (Ref. 15, pp. 6, 11, 12, 14, 21 through 25). Ground water samples collected in 2004 from shallow, intermediate, and deep monitoring wells at the Kerr-McGee – Jacksonville property contained the following contaminants at elevated concentrations: alpha-BHC, beta-BHC, DDD, gamma-chlordane, arsenic, and/or lead (Ref. 5, Appendix G, Tables G7 and G10) (see Section 3.0 of this HRS documentation record). Monitoring wells MW-6T and MW-5T collected south and east of Source 1, respectively contained elevated concentrations of alpha-BHC, beta-BHC, gamma-BHC, and alpha-chlordane (Refs. 37, pp. 31, 50; 44). A ground water sample collected in 1992 from a 1,055- foot deep Floridan Aquifer well (J-7323) located at the Kerr-McGee – Jacksonville property contained Dursban® at 0.81 µg/L (Ref. 81, pp. 1, 8). Chlorpyrifos is the active ingredient in Dursban® (Ref. 82, p. 2).

The facility is located in an industrial area (Refs. 3; 12, p. 3; 14, p. 5; 20; 68, p. 2). Several other industrial facilities have operated and still operate in the immediate vicinity of the Kerr-McGee property (Refs. 5, pp. 1-7, 1-8; 6, Figure 1-4). Pesticides have been detected on two of the nearby properties: the

FMC Corporation property located southwest of the Kerr-McGee – Jacksonville property and on the CSX property located adjacent to the southern border of the Kerr-McGee – Jacksonville property (Refs. 5, p. 1-8; 6, Figure 1-4). Potentiometric surface maps prepared based on ground water elevations collected during monitoring well sampling activities indicate that the direction of ground water flow in the three zones of the surficial aquifer are as follows: shallow, east-southeast; intermediate, east-southeast; and deep, north, northeast (Ref. 5, pp. 3-7, 3-8, Figures 3-6 through 3-14). The FMC property is not located upgradient ground water flow at the Kerr-McGee – Jacksonville property, but is located side-gradient to the southwest (Ref. 6, Figure 1-4). Based on ground water flow patterns the CSX property is side gradient and down gradient of ground water flow in the shallow and intermediate zones of the surficial aquifer, and upgradient in the deep zone of the shallow aquifer (Refs. 5, Figures 3-6 through 3-14; 6, Figures 2-1, 2-2, and 2-3). The Toyota property is located north and both side gradient and upgradient of the Kerr-McGee – Jacksonville property (Ref. 5, Figure 1-3). A ground water sample collected from intermediate monitoring well No. MW-24TD in December 2004 did not have pesticides above the laboratory contract reporting limit (Refs. 35, p. 49; 49).

The contamination documented in the observed release is at least partially attributable to Kerr-McGee - Jacksonville. Background ground water samples were collected from areas that are upgradient of past facility operations and downgradient of other possible sources of contamination (Ref. 5, Figure 2-3). Contaminated samples collected throughout the Kerr-McGee – Jacksonville property contained elevated concentrations of pesticides know to have been purchased by Kerr-McGee and detected in Sources 1 and 2 (Refs. 5, Figure 2-3, Appendix B, Appendix G, Tables G-7 and G-10) (also see Sections 2.2.2 for Sources 1 and 2 and Section 3.1.3 of this HRS documentation record). Further, ground water samples collected by Kerr-McGee – Jacksonville in May 1984 contained alpha-BHC, beta-BHC, gamma-BHC, DDE, endrin, chlordane, and toxaphene (Ref. 14, pp. 41, 42, Appendix H). Also, previous sampling events documented concentrations of arsenic, lead, alpha-BHC, beta-BHC, gamma-BHC, DDE, endrin, chlordane, and toxaphene (Ref. 7, pp. 5-11, 5-12, Table 5-4, pp. 1 of 4, 3 of 5, and 4 of 5).

Hazardous Substances Released

Alpha-BHC, beta-BHC, DDD, gamma-chlordane, arsenic, and lead

Ground Water Observed Release Factor Value: 550

3.1.2 POTENTIAL TO RELEASE

3.1.2.1 Containment

TABLE 17: Ground Water Containment			
Source No.	Source Hazardous Waste Quantity Value	Containment Factor Value, Description (Ref. 1, Table 3-2)	References
1	866.66	10, no liner	5, Figures 4-37, 4-38; 13, p. 2; 14, pp. 5, 6
2	Undetermined, but greater than zero	10, no liner	5, Appendix D

Containment Factor Value: 10

3.1.2.2 Net Precipitation

Based on Reference 1, Figure 3-2, and Reference 3, the net precipitation factor value for the Kerr McGee property located in Jacksonville, Florida is 3.

Net Precipitation Factor Value: 3
(Ref. 1, Figure 3-2)

3.1.2.3 Depth to Aquifer

Aquifer Being Evaluated: Lower Floridan Aquifer

Depth to Lowest Known Point of Hazardous Substances (feet): 70

Depth to aquifer was evaluated by determining the depth from the lowest known point of hazardous substances at a site to the top of the aquifer being evaluated, the Lower Floridan Aquifer, which underlies the middle semi-confining unit, considering all layers in that interval (Ref. 1, Section 3.1.2.3). Observed releases of arsenic and lead have been documented in permanent monitoring well MW-12TVD located north of the former fertilizer plant storage warehouse at a depth of 70 feet (see Tables 14 and 16 of this HRS documentation record) (Refs. 5, Table 2-1, Figure 2-3, Appendix K, p. 25; 36, p. 39; 39, p. 14). Ground water flow in the Floridan occurs in solution enlarged openings, which is characteristic of karst conditions (Refs. 27, p. 17; 64; 68, Plates 2 and 13). As directed by the HRS, a thickness of 0 feet was assigned to all karst aquifers that underlie the sources (Ref. 1, Section 3.1.2.3). Jacksonville area geology information is used to determine thicknesses for all other layers. The largest thicknesses available that were documented from geologic information in proximity to the Kerr-McGee – Jacksonville area were selected for the non-karst layers (see Table 18 of this HRS documentation record). It should be noted, however, that even if the minimum regional thicknesses for the layers between the lowest known point of contamination and the top of the Lower Floridan Aquifer discussed in Section 3.0.1 of this HRS documentation record were applied (~543ft. – 70ft.= 473 cumulative feet from the lowest known point of contamination to the top of the Lower Floridan Aquifer), the same (and most conservative) depth to aquifer factor value would still be assigned (see HRS Table 3-5).

TABLE 18 – Depth to Aquifer					
Aquifer/Layer (In descending order, beginning at lowest known point of hazardous substances)	**Karst? (Yes/No)**	**Total Depth (feet bls)** [1]	**Thickness (feet)**	**Cumulative Thickness (feet)**	**References**
Post-Miocene Deposits (Surficial Aquifer)	No	120	120	120	53, p. 1-1; 56, pp. 18-19
Hawthorn Group (Upper Confining Unit)	No	525	405	525	25, Plates 2 and 6; 68, p. 17
Upper Floridan Aquifer	Yes	680	0[2]	525	1, Section 3.1.2.3; 25, Table 2, Plate 2; 27, p. 17; 53, p. 1-4
Middle-semi-confining unit	No	1,100	420	945	1, Section 3.1.2.3; 25, Table 2, Plate 2; 53, p. 1-4

Notes:

1 Total depth to the bottom of the aquifer/layer below land surface

2 Per HRS Section 3.1.2.3 and HRS Table 3-5, karst aquifers underlying the sources at the site are assigned a thickness of 0 feet.

bls below land surface

The total cumulative depth to the top of the Lower Floridan Aquifer is 945 feet. Per HRS, Section 3.1.2.3, the depth from the lowest known point of contamination (70 feet) is subtracted from the cumulative depth to the top of the Lower Floridan Aquifer (945 feet), and the result is applied to HRS Table 3-5 to assign the depth to aquifer factor value.

945 feet – 70 feet = 870 feet

Depth to Aquifer Factor Value: 1
(Ref. 1, Section 3.1.2.3, Table 3-5)

3.1.2.4 Travel Time

TABLE 19: Travel Time				
Layer	**Type of Material**	**Thickness (feet)** [1]	**Hydraulic Conductivity (cm/sec)**	**References**
Post-Miocene Deposits (Surficial Aquifer)	Sand, gravel, clay, shells, limestone, and marl.	40[2]	10^{-4}	1, Table 3-6; 25, Table 2
Hawthorn Group	Sand, clay, and dolomite, and sandy phosphatic dolomite and marl	405	10^{-6}	1, Table 3-6; 25, Table 2
Upper Floridan Aquifer	Porous limestone containing large solution cavities and caves in recharge areas; cream-colored to brown, chalky to well-indurated, pelletal to micritic limestone interbedded with cream-colored to dark brown, fine to medium crystalline, and slightly vuggy dolomite	0	10^{-2}	1, Table 3-6; 25, Table 2
Middle-semi-confining unit	Limestone	420	10^{-4}	1, Table 3-6; 25, Table 2

Note:

1 Travel time was calculated based on the thickness of the layer (i.e., the formation/aquifer) between the lowest known point of contamination document in observed releases in ground water samples collected at the Kerr-McGee – Jacksonville property and the top of the aquifer being evaluated (the Lower Floridan Aquifer). This value was taken from the thickness for each layer presented in Table 18.

2 The 70 feet to the lowest known point of hazardous contamination was subtracted from the thicknesses of the post-Miocene deposits. As per HRS Section 3.1.2.4, the first 10 feet of the depth to aquifer were also subtracted.

cm/sec Centimeters per second

Lowest Hydraulic Conductivity: 10^{-6}
Thickness of Layer(s) with Lowest Hydraulic Conductivity (ft): 405 feet (Hawthorn Group)

Travel Time Factor Value: 5
(Ref. 1, Table 3-7)

3.1.2.5 Calculation of Potential to Release Factor Value

Net Precipitation Factor Value: 3
Depth to Aquifer Factor Value: 1
Travel Time Factor Value: 5

Sum of Values: 9
Sum of Values x Containment Factor Value: $10 \times 9 = 90$

Potential to Release Factor Value: 90

3.2 WASTE CHARACTERISTICS

3.2.1 TOXICITY/MOBILITY

The toxicity and mobility factor values for the hazardous substances detected in the source samples with containment factor values of greater than 0 are summarized in Table 20. The combined toxicity and mobility factor values are assigned in accordance with Reference 1, Section 3.2.1. Hazardous substances detected in the observed release to ground water are assigned a mobility factor value of 1 (Ref. 1, Section 3.2.1.2).

TABLE 20: Ground water Toxicity/Mobility						
Hazardous Substance	**Source No.**	**Toxicity Factor Value**	**Mobility Factor Value**	**Does Hazardous Substance Meet Observed Release? (Yes/No)**	**Toxicity/ Mobility (Table 3-9)**	**Reference**
Alpha-BHC	1,2	10,000	1	Y	10,000	2, p. BI-7
Beta-BHC	1,2	100	1	Y	100	2, p. BI-7
Gamma- BHC	1,2	10,000	1	N	10,000	2, p. BI-8
Alpha-chlordane	1,2	10,000	1E-2	N	100	2, p. BI-3
Gamma-chlordane	1,2	10,000	1[a]	Y	10,000	2, p. BI-3
DDD	1,2	100	1[a]	Y	100	2, p. BI-4
DDE	1,2	100	1	N	100	2, p. BI-4
DDT	2	1,000	1E-4	N	0.10	2, p. BI-4
Dieldrin	1,2	10,000	1E-2	N	10,000	2, p. BI-5
Endosulfan I	2	100	1	N	100	2, p. BI-6
Endosulfan II	2	100	1	N	100	2, p. BI-6
Endrin	1	10,000	1E-2	N	100	2, p. BI-6
Endrin aldehyde	2	0	1E-4	N	0	2, p. BI-6
Heptachlor	2	1,000	1E-4	N	0.10	2, p. BI-6
Toxaphene	2	1,000	1E-4	N		2, p. BI-11
Arsenic	2	10,000	1	Y	10,000	2, p. BI1
Lead	2	10,000	1	Y	10,000	2, p. BI-8

Notes:

[a] Documented in observed release to ground water. A mobility factor value of 1 is assigned (Ref. 1, Section 3.2.1.2).

BHC Hexachlorocyclohexane
DDD Dichlorodiphenyldichloroethane
DDE Dichlorodiphenyldichloroethylene, p,p-
DDT Dichlorodiphenyltrichloroethane, 4,4-
No. Number

Toxicity/Mobility Factor Value: 10,000.00
(Reference 1, Table 3-9)

3.2.2 HAZARDOUS WASTE QUANTITY

TABLE 21: Hazardous Waste Quantity		
Source No.	**Source Type**	**Source Hazardous Waste Quantity**
1	Backfilled surface impoundment	866.66
2	Contaminated soil	Undetermined, but greater than zero

Sum of Values: 866.66

Hazardous Waste Quantity Factor Value: 100
(Ref. 1, Table 2-6)

3.2.3 WASTE CHARACTERISTICS FACTOR CATEGORY VALUE

Toxicity/Mobility Factor Value: 10,000
Hazardous Waste Quantity Factor Value: 100
Toxicity/Mobility Factor Value × Hazardous Waste Quantity Factor Value: 1,000,000

Waste Characteristics Factor Category Value: 32
(Ref. 1, Table 2-7)

3.3 TARGETS

Residents in Duval County, Florida are provided drinking water by the JEA (Refs. 3; 54; 55). In Duval County, Florida, the JEA service area is comprised of a Major Grid and the Mayport Grid (Ref. 62, p. 2). The major grid is subdivided into a North and a South Grid that form an interconnected distribution system (Refs. 54; 57; 62, p. 2). The Mayport grid is not connected to the Major grid and its wells are not located within the 4-mile radius of the Kerr McGee sources (Ref. 62, p. 3). The North Grid serves residents to the north and west of the St. Johns River, and the South Grid serves residents to the south and east of the St. Johns River (Ref. 54, p. 1). The North Grid has nine water treatment plants (WTP) with a total of 60 wells and the South Grid has 13 WTPs with a total of 72 wells. The total number of wells in the JEA Major grid system is 132 wells. Water from the North and South Grids mix in the distribution lines forming one interconnected system (Ref. 54, pp. 1, 2, 3, 8). The Major grid of JEA serves about 800,000 people (Ref. 57, p. 2). Therefore, each well in the Major grid (north and south) serve an average of about 6,060.60 people, which was calculated as follows: 800,000 ÷ 132 = 6,060.60 persons per well (Ref. 54, pp. 1, 2). None of the JEA wells provide more than 40 percent of the total water supply (Ref. 54, p. 2). All of the JEA wells are completed in the Floridan Aquifer system, which is comprised of the Upper and Lower Floridan aquifers (Refs. 53, pp. 1-1, 1-4, 4-2, 4-3; 54, p. 2).

Within the 4-mile radius of the Kerr McGee property, there are three North Grid wellfields with 21 municipal wells that serve about 127,272.6 people (21 wells × 6,060.60 persons per well) (Refs. 3; 54). Also, the South Grid has 3 wellfields with 16 municipal wells that serve about 96,969.6 people (16 wells × 6,060.60 persons per well) (Refs. 3; 54). The nearest JEA well to the Kerr McGee property is located in the North Grid about 1.1 miles to the west (Ref. 3). Table 22 provides the distance of each JEA well from the Kerr McGee property.

The total estimated population using ground water for drinking water within 4 miles of the Kerr McGee property is distributed as follows: 0 to 0.25 mile, 0 persons; greater than 0.25 to 0.50 mile, 0 persons; greater than 0.50 to 1 mile, 0 persons; 1 to 2 miles, 72,727.20 persons; 2 to 3 miles, 48,484.8 persons; and greater than 3 to 4 miles, 103,030.20 persons (see Table 23 of this HRS documentation record).

TABLE 22: Municipal Drinking Water Wells Within a 4-Mile Radius Of Kerr McGee Upper and Lower Floridan Aquifers								
Distance in Miles	**Water Treatment Plant**	**Well No.**	**Depth in feet**	**Level I Cont. (Y/N)**	**Level II Cont. (Y/N)**	**Potentia l Cont. (Y/N)**	**Population Served**	**References**
1.2	Main Street	0105	1,286	N	N	Y	6,060.60	3; 54, p. 3
1.3	Main Street	0104	1,302	N	N	Y	6,060.60	3; 54, p. 3
1.5	Arlington	5402	954	N	N	Y	6,060.60	3; 54, p. 4
1.5	Main Street	0101	1,276	N	N	Y	6,060.60	3; 54, p. 3
1.5	Main Street	0108	1,248	N	N	Y	6,060.60	3; 54, p. 3
1.75	Arlington	5404	814	N	N	Y	6,060.60	3; 54, p. 4
1.75	Arlington	5403	1105	N	N	Y	6,060.60	3; 54, p. 5
1.75	Main Street	0102	1,319	N	N	Y	6,060.60	3; 54, p. 3
1.75	Main Street	0119	1,284	N	N	Y	6,060.60	3; 54, p. 3
1.75	Main Street	0103	1,282	N	N	Y	6,060.60	3; 54, p. 3
1.8	Arlington	5405	1,117	N	N	Y	6,060.60	3; 54, p. 5
1.8	Main Street	0120	1,282	N	N	Y	6,060.60	3; 54, p. 3
2	Main Street	0107	1,303	N	N	Y	6,060.60	3; 54, p. 3
2.2	Arlington	5406	963	N	N	Y	6,060.60	3; 54, p. 5
2.4	Hendricks	5501	1,270	N	N	Y	6,060.60	3; 54, p. 5
2.4	Hendricks	5502	1,252	N	N	Y	6,060.60	3; 54, p. 5
2.6	Hendricks	5002	1,297	N	N	Y	6,060.60	3; 54, p. 5
2.7	Hendricks	5001	1,291	N	N	Y	6,060.60	3; 54, p. 5
2.75	Hendricks	5003	1,286	N	N	Y	6,060.60	3; 54, p. 5
2.8	Hendricks	5108	1,296	N	N	Y	6,060.60	3; 54, p. 5
3	Hendricks	5107	1,012	N	N	Y	6,060.60	3; 54, p. 5
3.1	Norwood	0404	1,200	N	N	Y	6,060.60	3; 54, p. 4
3.3	Lovegrove	5204	1,030	N	N	Y	6,060.60	3; 54, p. 6
3.3	Norwood	0401	1,341	N	N	Y	6,060.60	3; 54, p. 4
3.4	Fairfax	0302	1,320	N	N	Y	6,060.60	3; 54, p. 3
3.4	Hendricks	5110	1,288	N	N	Y	6,060.60	3; 54, p. 6
3.4	Lovegrove	5201	1,020	N	N	Y	6,060.60	3; 54, p. 6
3.5	Fairfax	0304	1,356	N	N	Y	6,060.60	3; 54, p. 3
3.5	Fairfax	0308	1,365	N	N	Y	6,060.60	3; 54, p. 3
3.5	Fairfax	0307	1,338	N	N	Y	6,060.60	3; 54, p. 3
3.5	Lovegrove	5203	1,005	N	N	Y	6,060.60	3; 54, p. 6
3.5	Norwood	0403	1,235	N	N	Y	6,060.60	3; 54, p. 4
3.5	Norwood	0402	1,303	N	N	Y	6,060.60	3; 54, p. 4
3.6	Fairfax	0305	1,280	N	N	Y	6,060.60	3; 54, p. 3
3.75	Fairfax	0301	1,309	N	N	Y	6,060.60	3; 54, p. 3
3.8	Fairfax	0303	1,362	N	N	Y	6,060.60	3; 54, p. 3
3.8	Fairfax	0306	1,300	N	N	Y	6,060.60	3; 54, p. 3

Notes:

>	Greater than
Cont.	Contamination
N	No
WTP	Water treatment plant
Y	Yes

3.3.1 NEAREST WELL

Ground water flow in the Floridan aquifer system is contained in solution-enlarged openings in carbonate formations. In the vicinity of Jacksonville, Florida, this represents karst ground water flow (Refs. 24, pp. 3, 5, 6; 25, pp. D-21, through D-25). Karst ground water flow occurs in the Upper and Lower Floridan aquifers within the entire 4-mile radius of the Kerr McGee property (Ref. 64). All of the JEA wells are completed in the Floridan Aquifer system, which underlies the 4-mile radius (Refs. 3; 25, p. D3; 54, p. 2). In accordance with Reference 1, Section 3.3.1., the nearest well factor value was assigned based on karst ground water flow in the Upper and Lower Floridan aquifers.

Nearest Well Factor Value: 20
(Ref. 1, Section 3.3.1, Table 3-11)

3.3.2 POPULATION

3.3.2.1 Level of Contamination

3.3.2.2 Level I Concentrations

No Level I wells have been identified.

Level I Concentrations Factor Value: 0.00

3.3.2.3 Level II Concentrations

No Level II wells have been identified.

Level II Concentrations Factor Value: 0.00

3.3.2.4 Potential Contamination

Distance-weighted population values for potential contamination ground water targets for the Upper and Lower Floridan aquifers are presented in Table 23. Ground water flow in the Floridan aquifer system is contained in solution-enlarged openings in carbonate formations. In the vicinity of Jacksonville, Florida, this represents karst ground water flow (Refs. 24, pp. 3, 5, 6; 25, pp. D-21, through D-25). Karst ground water flow occurs in the Upper and Lower Floridan aquifers within the entire 4-mile radius of the Kerr McGee property (Ref. 64).

TABLE 23: Distance-Weighted Population Values				
Distance Category	**Number of wells**	**Population**	**Distance-Weighted Population Value (Ref. 1, Table 3-12)**	**References**
0 to 1/4 mile	0	0	0	3; 54; 55; 57; 62
>1/4 to 1/2 mile	0	0	0	3; 54; 55; 57; 62
>1/2 to 1 mile	0	0	0	3; 54; 55; 57; 62
>1 to 2 miles	12	72727.20	26,068	3; 54; 55; 57; 62
>2 to 3 miles	8	48,484.80	26,068	3; 54; 55; 57; 62
>3 to 4 miles	17	103,030.20	81,623	3; 54; 55; 57; 62

Notes: > Greater than

Calculations:

Sum of Distance-Weighted Population Values: 133,759
Sum of Distance-Weighted Population Values/10: 13,375.9

Potential Contamination Factor Value: 13,375.9

3.3.3 RESOURCES

JEA provides water to customers for irrigation purposes (Ref. 54, p. 1). However, it is not known for which purpose the water is used. Therefore, resources were not scored.

Resources Factor Value: 0.00

3.3.4 WELLHEAD PROTECTION AREA

The FDEP Wellhead Protection Program is a pollution prevention and management program that is designed to protect underground sources of drinking water from contamination. A wellhead protection area is defined as the surface and subsurface area surrounding a public water supply well, through which contaminants are reasonably likely to move toward and reach the well. The Wellhead Protection Rule establishes a 500-foot radius around all wells that serve community and nontransient, noncommunity public water systems (Ref. 52). The Florida Wellhead Protection Program was approved by EPA on August 18, 1998 (Ref. 52). Also, the City of Jacksonville has a well protection program and in general there is at least a 500-foot buffer around each well. However, the City of Jacksonville uses a 750-foot search radius around each proposed well to identify potential sources of known contamination (Ref. 52; 54, p. 1). The municipal wells in the JEA Wellhead Protection Program are located within the 4-mile radius of the Kerr-McGee – Jacksonville property (Refs. 1, Section 3.3.4; 3).

Wellhead Protection Area Factor Value: 5.00

4.0 SURFACE WATER MIGRATION PATHWAY

4.1 OVERLAND/FLOOD MIGRATION COMPONENT – St. Johns River

4.1.1.1 Definition of Hazardous Substance Migration Path for Overland/Flood Component

The elevation of the Kerr-McGee property is about 5 feet above mean sea level (Refs. 3; 4, p. 2; 6, Figure 1-1; 20). Currently, the Kerr-McGee property is vacant (Ref. 9, p. 2). Based on topographic maps of the area, the surface drainage in the vicinity of the Kerr-McGee property is to the east towards the St. Johns River and to the south towards Deer Creek (Refs. 3; 4, p. 2; 20). According to Kerr-McGee, the property is graded toward an east-west trending swale located in the central portion of the property in the area of the former fertilizer building (Refs. 5, p. 3-4; 16, pp. 75, 86). From the swale, runoff is directed eastward to the St. Johns River (Ref. 5, p. 3-4, Figure 3-2).

During operations, storm water runoff from the pesticide formulation and fertilizer manufacturing plants discharged to the St. Johns River via drainage ditches on the Kerr-McGee property (Ref. 14, pp. 4, 5). The first drainage ditch (designated as Drainage Ditch 1) originated south of the fertilizer manufacturing plant, flowed in a west to east trending direction and emptied into the St. Johns River (Refs. 5, Figure 1-2; 14, pp. 4, 5). The second drainage ditch (designated as Drainage Ditch 2) originated in the southwestern portion of the pesticide formulation plant, traversed the property in a west to northeast trending direction, before emptying into the St. Johns River at the northeastern corner of the property, north of the former fertilizer manufacturing plant (Refs. 5, Figure 1-2; 14, p. 4). From 1974 to 1979, Kerr-McGee was authorized to discharge any and all point sources of non-process wastewater to the St. Johns River at two outfalls under a Florida Department of Environmental Regulation (FDER) approved National Pollutant Discharge Elimination System (NPDES) permit (Ref. 14, pp. 4, 10, Appendix C, pp. 1, 2). Outfall No. 1 was located in the southeastern portion of the fertilizer manufacturing plant, near the southern end of the former loading dock (Refs. 5, Figure 1-2; 14, p. 4). The location of Outfall No. 1 appears to be the discharge location of Drainage Ditch 1, which was located south of the fertilizer manufacturing plant (Refs. 5, Figure 1-2, 14, pp. 4, 10). Outfall No. 2 was located in the northeastern portion of the property north of the fertilizer manufacturing plant at the northern end of the former loading dock (Refs. 5, Figure 1-2; 14, p. 4; 63, p. 24). The location of Outfall No. 2 appears to be the discharge location of Drainage Ditch 2, which was located north of the fertilizer manufacturing plant (Refs. 5, Figure 1-2; 14, p. 4).

Surface water runoff from Source No. 1, the backfilled surface impoundment, is directed to a low lying area (swale) located on the property, then to the St. Johns River, as depicted by the current storm water flow pattern (Ref. 5, pp. 3-2, 3-4, Figure 3-2). Surface water runoff from Source No. 2, contaminated soil located throughout the Kerr-McGee property, follows natural drainage routes, and eventually flows towards the St. Johns River (Ref. 5, Figure 3-2). Outfall No. 1 is evaluated as probable point of entry (PPE) 1 and Outfall No. 2 is evaluated as PPE 2 (Ref. 20). Runoff from Source No. 1 most likely enters the St. Johns River at PPE 2 and runoff from Source No. 2 most likely enters the St. Johns River at PPEs 1 and 2 (Ref. 5, Figures 2-2, 3-1, and 3-2).

From PPE 2, the most downstream PPE, the St. Johns River flows north for more than 15 miles completing the 15-mile surface water migration pathway target distance limit (TDL) (Ref. 20). The St. Johns River is tidally influenced. During periods of low water, tides may cause reverse flow as far as Lake Monroe, which is about 161 miles upstream of the mouth of the river in Duval County, which is approximately 142 miles upstream of the Kerr-McGee property (Refs. 78, pp. 2, 3). The daily mean flow rate of the St. Johns River obtained from the U.S. Geological Survey from a gauging station approximately 4.3 miles upstream of the Kerr-McGee property for the years of 1971 to 2009 is 7,738 cubic feet per second (Refs. 20; 70, pp. 1, 3). The St. Johns River flows very slowly; the total drop from the headwaters of the river to its mouth is about 30 feet, or about 1 inch per mile (Ref. 78, p. 2).

Most of the Kerr-McGee property is located within the 500-year flood plain of the St. Johns River. The eastern edge of the Kerr-McGee property is located within the 100-year flood plain of the St. Johns River with a base flood elevation of 5 feet (Refs. 9, p. 3; 69, pp. 1, 2).

4.1.2.1 LIKELIHOOD OF RELEASE

4.1.2.1.1 OBSERVED RELEASE – Chemical Analysis

Background Samples

February 2001 Kerr-McGee Remedial Investigation

The sediment sample listed in Table 24 was collected in February 2001 from the St. Johns River during the Kerr-McGee RI (Ref. 5, pp. 2-1, 2-16, Table 2-7, Figure 2-4, Appendix D, p. 114). The final RI/FS Work Plan Addendum for OU2 summarizes the sampling procedures and scope of the sediment sampling program for the St. Johns River (Refs. 5, p. 2-16; 75, pp. 1-1, 1-2, 5-1, 5-2). Background sediment sample KMC-IT-SD-11 was collected from the St. Johns River about 380 feet upstream of PPE 1 (Ref. 5, Figure 2-4; 20). The background sediment sample was collected at 0 to 4 inches below the bed of the river at a location about 50 feet from the river bank (Ref. 5, Figure 2-4, Appendix F, p. 54). The location of the background sediment sample is provided in Figure 2-4 of Reference 5. The chain of custody record is provided in Reference 29, and field notes are provided in Appendix D of Reference 5.

The background sediment sample and the downstream sediment samples were collected during the same sampling event and in accordance with the same sampling procedures (Refs. 5, pp. 2-16, 4-44, Table 2-7, Figure 2-4, Appendix D, pp. 112, 114; 29, pp. 19, 22; 75, pp. 1-1, 1-2, 5-1, 5-2). Also, the background and downstream sediment samples were collected from the same surface water body (Ref. 5, Figure 2-4, Appendix D, pp. 112, 114).

TABLE 24: Background Sediment Sample Descriptions – February 2001				
Sample ID	**Sample Location**	**Depth**	**Date Sampled**	**References**
St. Johns River				
KMC-IT-SD-11	About 380 feet upstream (south) of PPE 1, adjacent to the CSX Property	0 to 4 inches below river bed	02/28/2001	5, p. 2-16, Figure 2-4, Appendix D, p. 114, Appendix F, p. 54; 29, p. 22; 20

Notes:

ID Identification number
IT IT Corporation
KMC Kerr-McGee Chemical Corporation
PPE Probable point of entry
SD Sediment

Background Concentrations

The sediment sample listed in Table 25 was collected in February 2001 during the Kerr-McGee RI (Ref. 5, pp. 2-1, 2-16, 4-44, Table 2-7, Figure 2-4, Appendix D, p. 114). The sample was analyzed by Severn Trent Laboratories for pesticides using EPA SW-846 Method 8081 (Refs. 5, p. 4-44, Table 2-7; 72, pp. 26, 27, 31; 74, p. 1; 75, Table 5-2). The data validation report is contained in Reference 74. Analytical data sheets are contained in Reference 72. Adjusted sample specific reporting limits were calculated using the laboratory contract reporting limits, sample-specific percent solids, and dilution factors (Refs. 72, pp. 26, 27, 31; 73, pp. 1, 2; 79).

TABLE 25: Analytical Results for Background Samples – February 2001

Sample ID	Hazardous Substance	Concentration	Sample Specific RL	References
Background for St. Johns River				
KMC-IT-SD-11	DDT	410U µg/kg	410 µg/kg	5, Appendix D, p. 114; 29, p. 22; 72, pp. 26, 27, 31; 73, p. 1; 74; 79

Notes:

DDT Dichlorodiphenyltrichloroethane, 4,4-
ID Identification number
IT IT Corporation
KMC Kerr-McGee Chemical Corporation
µg/kg Micrograms per kilogram
RL Reporting limit
SD Sediments
U Analyte was not detected at or above the reporting limit

Contaminated Samples

Sediment samples listed in Table 26 were collected in February 2001 from the St. Johns River during the Kerr-McGee RI (Ref. 5, pp. 2-1, 2-16, Table 2-7, Figure 2-4, Appendix D, p. 112). The final RI/FS Work Plan Addendum for OU2 summarizes the sampling procedures and scope of the sediment sampling program for the St. Johns River (Refs. 5, p. 2-1; 75, pp. 1-1, 1-2, 5-1, 5-2). The sediment samples were collected 0 to 4 inches below the bed of the river and about 25 feet from the river bank (Ref. 5, p. 4-44, Figure 2-4). The locations of the sediment samples are provided on Figure 2-4 of Reference 5. The chain of custody record is provided in Reference 29 and field notes are contained in Appendix D of Reference 5.

TABLE 26: Sediment Samples – February 2001					
Sample ID	**Sample Location**	**Estimated Distance from PPE**	**Depth**	**Date Sampled**	**References**
St. Johns River					
KMC-IT-SD-14	St. Johns River, within 25 feet of the river bank, east of the former pesticide fertilizer building pad	About 150 feet downstream of PPE 1	0 to 4 inches below the river bed	02/26/2001	5, Figures 1-2, 2-4, Appendix D, p. 112; 29, p. 19

Notes:

ID Identification number
IT IT Corporation
KMC Kerr-McGee Chemical Company
PPE Probable point of entry
SD Sediment

Contaminated Concentrations

The sediment samples listed in Table 27 were collected in February 2001 during the Kerr-McGee RI (Ref. 5, pp. 2-1, 2-16, Appendix D, p. 112). The samples were analyzed by Severn Trent Laboratories for pesticides using EPA SW-846 Method 8081 (Refs. 5, p. 4-44, Table 2-7; 72, pp. 6, 7, 10; 74, p. 1; 75, Table 5-2). The data validation report is contained in Reference 74. Analytical data sheets are contained in Reference 72. Adjusted sample specific reporting limits were calculated using the laboratory contract reporting limits listed in the final RI/FS sampling plan, and the sample-specific percent solids and dilution factors (Refs. 72, pp. 6, 7, 10; 73, pp. 1, 2; 75, Table 5-2; 79).

TABLE 27: Analytical Results for Sediment Samples – February 2001

Sample ID	Hazardous Substance	Concentration	Sample Specific RL	References
St. Johns River				
KMC-IT-SD-14	DDT	3,300 µg/kg	280 µg/kg	5, Appendix D, p. 112; 29, p. 19; 72, pp. 6, 7, 10; 73, p. 1; 74

Notes:

DDT Dichlorodiphenyltrichloroethane, 4,4-
FD Field duplicate sample
IT IT Corporation
KMC Kerr-McGee Chemical Corporation
µg/kg Micrograms per kilogram
RL Reporting limit
SD Sediment

Background Samples

Sediment Sampling August 2008

The background sediment samples listed in Table 28 were collected from the St. Johns River by Kerr-McGee in August 2008 (Ref. 63, pp. 7, 9, 24). The work plan for additional sediment sampling summarizes the scope of work and sampling procedures for the sediment samples collected at Kerr-McGee in August 2008 (Refs. 63, p. 9; 65, p. 1). Background sediment samples SC-21 and SC-22 were collected from the St. Johns River. Specifically, background sediment sample SC-21 was collected about 250 feet east-southeast and upstream of PPE 1 and background sediment sample SC-22 was collected about 540 feet southeast and upstream of PPE 1 (Refs. 20; 63, p. 24). The background sediment samples were collected using a ponar dredge at 0 to 6 inches below the bed of the river (Refs. 63, p. 9; 65, p. 1). The location of the background sediment samples are provided in Figure 2-1 of Reference 63 (Ref. 63, p. 24). The chain of custody record is provided in Reference 63 (Ref. 63, pp. 52, 599). Field notes are contained on the sample log sheets (Ref. 65, pp. 39, 40).

The background sediment sample and the downstream sediment samples were collected during the same sampling event and in accordance with the same sampling procedures (Refs. 63, pp. 9, 24; 65, pp. 1, 2). Also, the background sediment and downstream sediment samples were collected from the same surface water body (Refs. 20; 63, p. 24). The background and downstream sediment samples consisted of gray and tan/brown silt and fine sand, and shell fragments (Ref. Ref. 63, pp. 30, 32, 39, 40).

TABLE 28: Background Sediment Sample Descriptions – August 2008

Sample ID	Sample Location	Depth	Date Sampled	References
St. Johns River				
SC-21	About 250 feet upstream (east-southeast) of PPE 1, near the edge of the Federal Channel in the St. Johns River	0 to 6 inches below river bed	8/19/2008	20; 63, pp. 24, 39, 52, 599
SC-22	About 540 feet upstream (southeast) of PPE 1, near the edge of the Federal Channel in the St. Johns River	0 to 6 inches below river bed	8/19/2008	20; 63, pp. 24, 40, 52, 599

Notes:

ID Identification number
PPE Probable point of entry
SC Sediment core sample

Background Concentrations

The background sediment samples listed in Table 29 were collected from the St. Johns River by Kerr-McGee in August 2008 (Ref. 63, p. 9, 24). Pesticide analysis was conducted by Test America using EPA SW-846 Method 8081A (Ref. 63, pp. 599, 638, 660). Arsenic analysis was conducted by Columbia Analytical Services in accordance with EPA SW-846 Method 6020 (Ref. 63, pp. 9, 52, 679, 703). Data validation was conducted in accordance with the EPA Region 4 Data Validation Standard Operating Procedures for CLP Routine Analytical Services, and the EPA CLP National Functional Guidelines for Organic Methods Data Review (Ref. 63, pp. 638, 679). Validated analytical data sheets and chain of custody records are contained in Reference 63 (Ref. 63, pp. 599, 660, 703). The method detection limits are contained on the validated analytical data sheets in Reference 63.

TABLE 29: Analytical Results for Background Samples – August 2008				
Sample ID	**Hazardous Substance**	**Concentration**	**MDL**	**References**
Background for St. Johns River				
SC-21	4,4-DDD	0.59 UJ µg/kg	0.46 µg/kg	63, pp. 17, 24, 39, 599, 660
SC-22	Arsenic	2.1 mg/kg	0.33 mg/kg	63, pp. 17, 24, 40, 599, 703

Notes:

DDD Dichlorodiphenyldichloroethane
ID Identification
J The concentration reported is between the method detection limit and practical quantitation limit. Sample results should be considered estimated with an unknown bias (Ref. 63, pp. 638, 645, 660). The presence of the analyte is not in doubt. No adjustment was needed in accordance with the data validation report and the EPA fact sheet *Using Qualified Data to Document an Observed Release and Observed Contamination* (November 1996) (Refs. 41, p. 5; 63, pp. 638, 660).
MDL Method detection limit
U Not detected (Ref. 63, p. 645).
µg/kg Micrograms per kilogram
mg/kg Milligrams per kilogram
SC Sediment core sample

Contaminated Samples

Sediment samples listed in Table 30 were collected from the St. Johns River by Kerr-McGee in August 2008 (Ref. 63, pp. 7, 9, 24). The work plan for additional sediment sampling summarizes the scope of work and sampling procedures for the sediment samples collected at Kerr-McGee in August 2008 (Refs. 63, p. 9; 65, p. 1). The sediment samples were collected using a ponar dredge at 0 to 6 inches below the bed of the river (Refs. 63, p. 9; 65, p. 1). The location of the sediment samples are provided in Figure 2-1 of Reference 63 (Ref. 63, p. 24). The chain of custody record is provided in Reference 63 (Ref. 63, pp. 51, 598). Field notes are contained on the sample log sheets (Ref. 63, pp. 30, 32). Sediment sample SC-12 consisted of gray silt and fine sand and sediment sample SC-14 consisted of gray silt, fine sand, and shell fragments (Ref. 63, pp. 30, 32).

TABLE 30: Sediment Samples – August 2008					
Sample ID	**Sample Location**	**Estimated Distance from PPE**	**Depth**	**Date Sampled**	**References**
St. Johns River					
SC-12	Near the northern end of the former Kerr-McGee dock on the St. Johns River. Downstream of PPE1 but upstream of PPE2.	660 feet downstream of PPE 1 175 feet upstream of PPE 2	0 to 6 inches below river bed	8/19/2008	20; 63, pp. 9, 24, 30, 51, 598
SC-14	Near the northern end of the former Kerr-McGee dock on the St. Johns River, and near the edge of the Federal Channel in the St. Johns River. Downstream of PPE1 but upstream of PPE2.	340 feet downstream of PPE 1 500 feet upstream of PPE 2	0 to 6 inches below river bed	8/19/2008	20; 63, pp. 9, 24, 32, 51, 598

Notes:

ID Identification number
PPE Probable point of entry
SC Sediment core sample

Contaminated Concentrations

The sediment samples listed in Table 31 were collected in August 2008 from the St. Johns River by Kerr-McGee (Ref. 63, p. 9, 24). Pesticide analysis was conducted by Test America using EPA SW-846 Method 8081A (Ref. 63, pp. 598, 638, 651). Arsenic analysis was conducted by Columbia Analytical Services in accordance with EPA SW-846 Method 6020 (Ref. 63, pp. 9, 51, 598, 679, 691). Data validation was conducted in accordance with the EPA Region 4 Data Validation Standard Operating Procedures for CLP Routine Analytical Services, the EPA CLP National Functional Guidelines for Organic Methods Data Review, and the EPA CLP National Functional Guidelines for Organic Methods Data Review (Ref. 63, pp. 638, 679). Validated analytical data sheets and chain of custody records are contained in Reference 63 (Ref. 63, pp. 51, 598, 651, 691). The method detection limits are contained on the validated analytical data sheets in Reference 63 (Ref. 613, pp. 651, 691).

TABLE 31: Analytical Results for Sediment Samples – August 2008

Sample ID	Hazardous Substance	Concentration	MDL	References
St. Johns River				
SC-12	Arsenic	6.53 mg/kg	0.46 mg/kg	63, pp. 16, 24, 30, 51, 691
SC-14	DDD	55J (5.5) µg/kg	1.4 µg/kg	63, pp. 16, 24, 32, 598, 638, 640, 641, 644, 645, 651

Notes:

( ) Concentration was adjusted in accordance with Reference 41
DDD Dichlorodiphenyldichloroethane
ID Identification
J The concentration reported is between the method detection limit and practical quantitation limit. Sample results should be considered estimated with an unknown bias (Ref. 63, pp. 638, 651). The presence of the analyte is not in doubt. The value presented parenthetically is the concentration obtained by applying EPA fact sheet *Using Qualified Data to Document an Observed Release and Observed Contamination* (November 1996) (Ref. 41; 63, pp. 638, 649, 650)
MDL Method detection limit
µg/kg Micrograms per kilogram
mg/kg Milligrams per kilogram
SC Sediment core sample

Additional Supporting Data

During the 1998 ESI, FDEP collected nine sediment samples on and in the vicinity of the Kerr-McGee – Jacksonville property at locations including Outfalls 1 and 2, in the St. Johns River at the confluence of and downstream of Outfalls 1 and 2 in Deer Creek, and a background location on the St. Johns River (Ref. 7, p. 4-2, 4-5, Figure 2-2). Sediment samples KMSD-4 and 8 collected at Outfalls 1 and 2 (PPE1 and PPE2, respectively) contained alpha-BHC, beta-BHC, alpha-chlordane, gamma-chlordane, DDD, DDE, DDT, dieldrin, and toxaphene (Ref, 7, Table 5-2). Sediment samples KCSD-5 through KMC-7 and KMC-SD-9 collected from the St Johns River between the Outfalls (PPE1 and PPE2) contained elevated levels of alpha-BHC, beta-BHC, alpha-chlordane, gamma-chlordane, DDD, DDE, DDT, dieldrin, heptachlor, and toxaphene. Sediments sample KMSD-9 collected from the St. Johns River at Outfall 2 (PPE 2) contained the highest concentrations of elevated contaminants some of which include: alpha-BHC, (360 μg/kg), beta-BHC (330 μg/kg), alpha-chlordane (1,800 μg/kg), gamma-chlordane (2,600 μg/kg), DDD (41,000J), DDE (2,700 μg/kg), DDT (11,000 μg/kg), dieldrin (2,200 μg/kg), endrin ketone (2,300 μg/kg), and toxaphene (46,000 μg/kg) (Ref. 7, Table 5-2). These concentrations are three times the concentrations documented in the event's designated background (KMSD-1) and the concentrations documented in sample KMSD-3, which is located at the confluence of Deer Creek and St. Johns River. These concentrations were alpha-BHC, (0.54U μg/kg), beta-BHC (0.54U μg/kg), alpha-chlordane (3.2 - 5.2 μg/kg), gamma-chlordane (6.4J – 9.5 μg/kg), DDD (12-31 μg/kg), DDE (4.3I – 7.4 μg/kg), DDT (1.4U μg/kg), dieldrin (0.54U μg/kg), endrin ketone (0.95U μg/kg), and toxaphene (34U μg/kg) (Ref. 7, Tables 4-1 and 5-2). The locations of sediment samples collected during the FDEP ESI are depicted on Figure 2-2 of Reference 7.

In February 2008, Kerr-McGee – Jacksonville collected nine sediment core samples from various areas on the St. Johns River in the vicinity of the former docks (Ref. 77, p. 2-3, Figure 2-2). Reference (background) sediment samples collected during this investigation were collected greater than 1 mile upstream of the Kerr-McGee – Jacksonville property (Ref. 77, Figure 3-5). Analytical results of the sediment samples collected on the St. Johns River in the immediate vicinity of the Kerr-McGee – Jacksonville facility contained elevated concentrations of hazardous substances including: aldrin, DDD, DDT, alpha-BHC, beta-BHC, dieldrin, and gamma-chlordane (Ref. 77, Figure 3-4, Table 3-7). When compared to the two reference samples collected about 1 mile upstream of the Kerr-McGee – Jacksonville property, sediment core sample SC-3A contained the highest concentrations of contaminants at elevated levels including: DDD (590J μg/kg), alpha-BHC (4,900J μg/kg), beta-BHC (1,800J μg/kg), and gamma-chlordane 160J μg/kg) (Ref. 77, Table 3-7, p. 1 of 2). Sediment core sample SC-3A was collected at a depth of 0 to 8 inches below the river bed (Ref. 77, p. 2-4, Table 3-7, p. 1 of 2). The locations of sediment core samples collected during the February 2008 Kerr-McGee – Jacksonville sediment sampling event are depicted on Figure 2-2 of Reference 77.

Attribution

Kerr McGee operated a pesticide formulation plant and a fertilizer manufacturing plant at the property located at 1611 Talleyrand Avenue in Jacksonville, Florida, from 1970 until 1978 (Refs. 13, p. 2; 14, p. 1).

Pesticide formulation operations consisted of pesticide blending and distribution (Ref. 14, p. 1). All active ingredients were purchased and blended with inert ingredients for the production of commercial pesticide products and distribution to customers (Ref. 14, pp. 1, 3). Pesticides were formulated at the facility in liquid, dust, granular, and pelletized forms (Ref. 14, p. 3). The pesticide production (Fasco) plant was divided into departments based on the form of pesticide produced (Ref. 14, p. 3). The departments for producing liquid pesticides were as follows: "Zinoil" unit; emulsifier unit; lime/sulfur unit, and small bottling unit (Ref. 14, p. 3). Pesticide dusts were produced in the following units: new sulfur plant; old sulfur plant; blenders #1, #2, #3; small package unit, and the J.B. Mill (Ref. 14, p. 3). Granular pesticide formulation took place inside the herbicide department, and the small package unit (Ref. 14, p. 3). Pelletized pesticides were also produced within the herbicide department (Ref. 14, p. 3).

Numerous pesticides were purchased for use at the pesticide formulation (Fasco) plant. Some of these pesticides included: endosulfan, methoxychlor, dieldrin, methylparathion, endrin, ethylparathion, toxaphene, heptachlor, aldrin, atrazine, BHC, lindane (gamma-BHC) chlordane petroleum derivative solvents and DDT among others (Refs. 14, Appendix A; 19, pp. 3, 4, 5). Formulated pesticides were packaged at the facility prior to wholesale distribution (Ref. 14, p. 3).

Fertilizers were also blended at the Kerr McGee property (Ref. 14, p. 9). The only types of fertilizers produced at the facility were dry and pulverized, granular, and semi-granular in form (Ref. 14, p. 9). Raw materials used in fertilizer formulation included the following: anhydrous ammonia, ammonium nitrate, ammonium phosphate, potassium nitrate, superphosphate, phosphate rock, sulfur, sulfuric acid, potash, borax, manganese, iron sulfate, copper sulfate, zinc sulfate, urea, ammonium chloride, calcium carbonate, calcium nitrate, calcium sulfate, potassium chloride, potassium sulfate, and sodium nitrate (Refs. 14, Appendix B; 19, p. 6).

From about 1974 to 1979, Kerr-McGee discharged any and all point sources of non-process wastewater and storm water runoff to the St. Johns River via two NPDES outfalls (Refs. 14, pp. 4, 5). A drainage ditch (Drainage Ditch 1) was located south of the fertilizer manufacturing plant (Ref. 14, p. 4). Storm water runoff from the pesticide formulation plant drained into a ditch (Drainage Ditch 2) that flowed to the river on the north side of the fertilizer manufacturing plant (Ref. 14, pp. 4, 5). The RI that Kerr-McGee prepared indicates that the property is currently graded toward an east-west trending low lying area (swale) located in the central portion of the property in the area of the former fertilizer building (Refs. 5, p. 3-4; 16, pp. 75, 86). From the low lying area (swale), runoff is directed eastward to the St. Johns River (Ref. 5, pp. 3-2, 3-4, Figure 3-2). This low lying area is evidenced by the current storm water flow for the Ker-McGee – Jacksonville property (Ref. 5, Figure 3-2).

Based on the drainage pattern discussed in the Kerr-McGee RI, runoff from Source No. 1 would flow to the south, enter the swale, and eventually be discharged into the St. Johns River at PPE 1; and runoff from Source No. 2 would traverse the property to the low lying area (drainage swale) and eventually be discharged into the St. Johns River at PPE 1 (Refs. 5, pp. 3-2, 3-4, Figure 3-2; 20). Runoff from Source No. 2 also is likely to be discharged into the St. Johns River via PPE 2 (Ref. 14, pp. 4, 5). The eastern portion of Source No. 2 is located in the 100-year flood plan of the St. Johns River (Ref. 69).

Analytical results of samples collected from Source Nos. 1 and 2 from October 2000 to December 2004 as part of the RI that Shaw conducted on behalf of Kerr McGee contained elevated concentrations of several raw product pesticides including endrin, endosulfan, dieldrin, DDT, toxaphene, heptachlor, alpha-BHC, and beta-BHC. Arsenic and lead, which were also used in pesticide formulation, were detected in Source Nos. 1 and 2 (Ref. 5, Appendix G, Tables G1 through G4) (also see Section 2.0 of this HRS documentation record). Sediment samples collected from the St. Johns River adjacent to the eastern boundary of the Kerr-McGee property contained DDD, DDT, dieldrin, gamma-chlordane, and arsenic (Refs. 5, Figure 2-4, Appendix D, p. 112; 20; 63, pp. 16, 24, 30, 32, 651, 691; 72, pp. 6, 7, 9), with DDD, DDT, and arsenic at observed release concentrations (see Section 4.1.2.1.1 of this HRS documentation record). The presence of these hazardous substances in sources at the Kerr-McGee facility and in the St. Johns River, and the lack of functioning and maintained run-on control and runoff management system indicate that Source Nos. 1 and 2 are not contained (Ref. 1, Table 4-2).

The facility is located in an industrial area (Refs. 3; 9, p. 2; 12, p. 3; 14, p. 5; 20). Several other industrial facilities have operated and still operate in the immediate vicinity of the Kerr-McGee property (Refs. 5, pp. 1-7, 1-8; 6, Figure 1-4). Pesticides have been detected on two of the nearby properties: the FMC Corporation property located southwest of the Kerr-McGee property and on the CSX property located adjacent to the southern border of the Kerr-McGee property (Refs. 5, p. 1-8; 6, Figure 1-4). The FMC property is not located adjacent to the Kerr-McGee property, but is located inland to the southwest. It is hydrologically connected to the St. Johns River via Deer Creek, which enters St. Johns River approximately 680 feet upstream of PPE 1 (Refs. 6, Figure 1-4; 20). Surface water runoff from the CSX property flows to Deer Creek, which makes up its southern border, and St. Johns River upstream of PPE1, which makes up its eastern border (Ref. 6, Figures 1-1 and 1-4). The surface water drainage patterns at the southwest corner of the Kerr-McGee property allow for storm water from Kerr-McGee to drain to the CSX property (Ref. 5, p. 3-4).

The contamination documented in the observed release is at least partially attributable to Kerr-McGee. All observed release background samples documented in this HRS documentation record are located upstream of PPE1 but downstream of the location where Deer Creek enters St. Johns River; therefore, the contamination contributions from FMC Corporation and contributions from CSX are screened out by the background samples (Refs. 5, Figure 2-4; 20; 63, p. 24). Further, contaminated samples collected directly beside the Kerr-McGee property shoreline, downstream of PPE1, document a significant increase of arsenic, DDD, and DDT, all of which were formulated and manufactured at the Kerr-McGee property during operations and have been detected in Sources 1 and 2, as illustrated below (Refs. 5, Figure 2-4, Appendix D, p. 112; 14, Appendix B; 20; 63, pp. 16, 24, 30, 32, 651, 691; 72, pp. 6, 7, 9) (see also Sections 2.2.2 for Sources 1 and 2 of this HRS documentation record and Section 4.1.2.1.1 of this HRS documentation record).

TABLE 32: Hazardous Substances Associated with Kerr-McGee Jacksonville And Documented in Observed Release to Surface Water

Pesticides Purchased by Fasco (Kerr-McGee) Plant	Substances Documented in Source 1 and/or Source 2	Substances Documented in the Observed Release to Surface Water
Aldrin	Arsenic	Arsenic
Atrazine	Alpha-BHC	DDD
BHC	Beta-BHC	DDT
Gamma-BHC	Gamma-BHC	
DDT	Alpha-chlordane	
Dieldrin	Gamma-chlordane	
Endrin	DDD	
Endosulfan	DDE	
Heptachlor	DDT	
Toxaphene	Dieldrin	
	Endosulfan I	
	Endosulfan II	
	Endrin	
	Endrin aldehyde	

TABLE 32: Hazardous Substances Associated with Kerr-McGee Jacksonville And Documented in Observed Release to Surface Water		
	Heptachlor	
	Lead	
	Toxaphene	

Hazardous Substances in the Release

DDD, DDT, arsenic

Surface Water Observed Release Factor Value: 550.00

4.1.2.2 Drinking Water Threat Waste Characteristics

4.1.2.2.1 Toxicity/Persistence

The toxicity and persistence factor values for the hazardous substances detected in the source samples with containment factor values of greater than 0 are summarized in Table 33. Arsenic, DDD, and DDT were detected at observed release concentrations in sediment samples collected from the St. Johns River within the TDL. The combined toxicity and persistence factor values are assigned in accordance with Reference 1, Section 4.1.2.2.1. Also see Section 2.2.2 for Sources 1 and 2 and Section 4.1.2.1.1, Observed Release by Chemical Analysis, of this HRS documentation record.

TABLE 33: Surface Water Toxicity/Persistence						
Hazardous Substance	**Source No.**	**Toxicity Factor Value**	**Persistence Factor Value[1]**	**Does Hazardous Substance Meet Observed Release? (Yes/No)**	**Toxicity/ Persistence Factor Value (Ref. 1, Table 4-12)**	**Reference**
Alpha-BHC	1,2	10,000	1.0	No	10,000	2, pp. BI-7, C-2
Beta-BHC	1,2	100	1.0	No	100	2, p. BI-7, C-2
Gamma- BHC (lindane)	1,2	10,000	1.0	No	10,000	2, p. BI-8, C-2
Alpha-chlordane	1,2	10,000	1.0	No	10,000	2, p. BI-3
Gamma-chlordane	1,2	10,000	1.0	No	10,000	2, p. BI-3
DDD	1,2	100	1.0	Yes	100	2, p. BI-4, C-1
DDE	1,2	100	1.0	No	100	2, p. BI-4, C-1
DDT	2	1,000	1.0	Yes	1,000	2, p. BI-4, C-1
Dieldrin	1,2	10,000	1.0	No	10,000	2, p. BI-5
Endosulfan I	2	100	1.0	No	100	2, p. BI-6
Endosulfan II	1	100	1.0	No	100	2, p. BI-6
Endrin	1	10,000	1.0	No	10,000	2, p. BI-6
Endrin aldehyde	2	0	1.0	No	0	2, p. BI-6
Heptachlor	2	1,000	0.4	No	400	2, p. BI-6
Toxaphene	2	1,000	1.0	No	1,000	2, p. BI-11
Arsenic	2	10,000	1.0	Yes	10,000	2, p. BI-1
Lead	2	10,000	1.0	No	1,000	2, p. BI-8

Notes:

[1]	Persistence factor value for rivers
BHC	Hexachlorocyclohexane
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene, p,p-
DDT	Dichlorodiphenyltrichloroethane, 4,4-
Ref.	Reference

Toxicity/Persistence Factor Value: 10,000.00
(Reference 1, Section 4.1.2.2.1, Table 4-12)

4.1.2.2.2 Hazardous Waste Quantity

TABLE 34: Hazardous Waste Quantity		
Source No.	**Source Type**	**Source Hazardous Waste Quantity**
1	Backfilled surface impoundment	866.66
2	Contaminated soil	>0
	Sum of values	866.66

Note:

> Greater than

The hazardous constituent quantity for Source No. 1 is not adequately determined. The estimated volume of the backfilled surface impoundment is about 2,166.66 yd^3 (see Source 1, Section 2.4.2.1.3 of this HRS documentation record).

The hazardous constituent quantity for Source No. 2 is not adequately determined. The area of contaminated soil located throughout the Kerr-McGee property is undetermined but greater than 0 (see Source 2, Section 2.4.2.1.3 of this HRS documentation record).

Hazardous Waste Quantity Factor Value: 100
(Ref. 1, Table 2-6)

Toxicity/Mobility Factor Value: 10,000
Hazardous Waste Quantity Factor Value: 100
Toxicity/Mobility Factor Value × Hazardous Waste Quantity Factor Value: 1,000,000

4.1.2.2.3 Calculation Of Drinking Water Threat Waste Characteristics Factor Category Value

The waste characteristics factor category was obtained by multiplying the toxicity/persistence and HWQ factor values, subject to a maximum product of 1×10^6. Based on this product, a value was assigned in accordance with Reference 1, Table 2-7.

Toxicity/Persistence Factor Value: 10,000.00
Hazardous Waste Quantity Factor Value: 100

Toxicity/Persistence Factor Value ×
Hazardous Waste Quantity Factor Value: 1×10^6

Waste Characteristics Factor Category Value: 32
(Reference 1, Table 2-7)

4.1.2.3 Drinking Water Threat Targets

No surface water intakes are located within the 15-mile TDL downstream of Kerr-McGee property (Ref. 54, p. 2).

4.1.2.3.3 Resources

TABLE 35: Resources		
Surface Water Body	**Resource Use**	**Reference**
St. Johns River	Major/Designated Recreation Area	Ref. 60, pp. 1, 4; 76 pp. 2, 4, 5, 7, 8

St. Johns River is used for recreational activities including fishing, boating, skiing, canoeing, kayaking, bird watching, and swimming (Refs. 60, pp. 1, 4; 66, p. 3). The Arlington Lions Club and Blue Cypress Parks, which are operated by the City of Jacksonville, are designated recreational areas that provide recreational activities on the St. Johns River (Ref. 76, pp. 2, 4, 5, 7, 8). Both parks are located within 3 miles downstream of the Kerr-McGee property (Ref. 76, pp. 4 through 9). The Arlington Lions Club Park has a boat ramp and the Blue Cypress Park has a fishing pier and board walk along the south bank of the St. Johns River (Ref. 76, pp. 4, 7).

Resources Factor Value: 5.00
(Ref. 1, Section 4.1.2.3.3)

4.1.3.2 Human Food Chain Threat Waste Characteristics

4.1.3.2.1 Toxicity/Persistence/Bioaccumulation

The toxicity, persistence, and bioaccumulation factor values for the hazardous substances detected in the source samples with containment factor values of greater than 0 are summarized in Table 36. Arsenic, DDD, and DDT were detected at observed release concentrations in sediment samples collected from the St. Johns River within the TDL. The combined toxicity, persistence, and bioaccumulation factor values are assigned in accordance with Reference 1, Section 4.1.3.2.1. Also see Section 2.2.2 for Sources 1 and 2 and Section 4.1.2.1.1, Observed Release by Chemical Analysis, of this HRS documentation record.

TABLE 36: Toxicity/Persistence/Bioaccumulation

Hazardous Substance	Source No.	Toxicity Factor Value	Persistence Factor Value[1]	Bioaccumulation Value[4]	Toxicity/ Persistence/ Bioaccumulation Factor Value (Ref. 1, Table 4-16)	Reference
Alpha-BHC	1,2	10,000	1.0	50,000[2]	5E+8	2, pp. BI-7, C-2
Beta-BHC	1,2	100	1.0	500	5E+4	2, p. BI-7, C-2
Gamma-BHC	1,2	10,000	1.0	50,000[3]	5E+8	2, p. BI-8, C-2
Alpha-chlordane	1,2	10,000	1.0	50,000[3]	5E+8	2, p. BI-3
Gamma-chlordane	1,2	10,000	1.0	50,000[3]	5E+8	2, p. BI-3
DDD	1,2	100	1.0	50,000[3]	5E+6	2, p. BI-4, C-1
DDE	1,2	100	1.0	50,000[3]	5E+6	2, p. BI-4, C-1
DDT	2	1,000	1.0	50,000[3]	5E+7	2, p. BI-4, C-1
Dieldrin	1,2	10,000	1.0	50,000[3]	5E+8	2, p. BI-5
Endosulfan I	2	100	1.0	500	5E+4	2, p. BI-6
Endosulfan II	1	100	1.0	500	5E+4	2, p. BI-6
Endrin	1	10,000	1.0	5,000[3]	5E+8	2, p. BI-6
Endrin aldehyde	2	0	1.0	5,000[3]	0	2, p. BI-6
Heptachlor	2	1,000	0.4	50,000[3]	2E+7	2, p. BI-6
Toxaphene	2	1,000	1.0	50,000[3]	5E+7	2, p. BI-11
Arsenic	2	10,000	1.0	500[2]	5E+4	2, p. BI-1

TABLE 36: Toxicity/Persistence/Bioaccumulation						
Hazardous Substance	**Source No.**	**Toxicity Factor Value**	**Persistence Factor Value[1]**	**Bioaccu-mulation Value[4]**	**Toxicity/ Persistence/ Bioaccumulation Factor Value (Ref. 1, Table 4-16)**	**Reference**
Lead	2	10,000	1.0	5,000[2]	5E+7	2, p. BI-8

Notes:

1 Persistence factor value for rivers
2 Bioaccumulation factor value for saltwater
3 Bioaccumulation factor value for freshwater
4 The St. Johns River is tidally influenced and contains brackish water (Ref. 79, p. 2). Therefore as stipulated by the HRS, the higher of the two bioaccumulation factor values is used (Ref. 1, Section 4.1.3.2.1.3).

BHC Hexachlorocyclohexane
DDD Dichlorodiphenyldichloroethane
DDE Dichlorodiphenyldichloroethylene, p,p-
DDT Dichlorodiphenyltrichloroethane, 4,4-
Ref. Reference

Toxicity/Persistence/Bioaccumulation Factor Value: 500,000,000.00
(Ref. 1, Section 4.1.3.2.1.4, Table 4-16)

4.1.3.2.2 Hazardous Waste Quantity

TABLE 37: Hazardous Waste Quantity		
Source No.	**Source Type**	**Source Hazardous Waste Quantity**
1	Backfilled surface impoundment	866.66
2	Contaminated soil	>0
Sum of values		866.66

Note:

\> Greater than

The hazardous constituent quantity for Source No. 1 is not adequately determined. The estimated volume of the backfilled surface impoundment is about 2,166.66 yd^3 (see Source 1, Section 2.4.2.1.3 of this HRS documentation record).

The hazardous constituent quantity for Source No. 2 is not adequately determined. The area of contaminated soil located throughout the Kerr-McGee property is undetermined but greater than 0 (see Source 2, Section 2.4.2.1.3 of this HRS documentation record).

Hazardous Waste Quantity Factor Value: 100
(Ref. 1, Table 2-6)

Toxicity/Mobility Factor Value: 10,000
Hazardous Waste Quantity Factor Value: 100
Toxicity/Mobility Factor Value × Hazardous Waste Quantity Factor Value: 1,000,000

4.1.3.2.3 Calculation Of Human Food Chain Threat
Waste Characteristics Factor Category Value

The waste characteristics factor category value was obtained by multiplying the toxicity/persistence and HWQ factor values, subject to a maximum product of 1×10^8. Based on this product, a value was assigned in accordance with Reference 1, Table 2-7.

Toxicity/Persistence Factor Value: 10,000.00
Hazardous Waste Quantity Factor Value: 100

Toxicity/Persistence Factor Value ×
Hazardous Waste Quantity Factor Value: 1×10^6

Toxicity/Persistence Factor Value ×
Hazardous Waste Quantity Factor Value (1×10^6) × Bioaccumulation Factor Value (50,000): 5×10^{10}

Waste Characteristics Factor Category Value: 320

(Reference 1, Table 2-7)

4.1.3.3 Human Food Chain Threat Targets

4.1.3.3.1 Food Chain Individual

As noted in Reference 1, Section 4.1.2.1.1 an observed release of a hazardous substance having a bioaccumulation factor value of 500 or greater is documented in the perennial surface waters of the St. Johns River (see Tables 24, 26, and 36 of this HRS documentation record). Commercial and subsistence fishing for human consumption occurs on the St. Johns River from the Arlington Expressway Bridge (U.S. 90, County Road 115, or Matthews Bridge) to the mouth of the river, which includes the zone of contamination (Refs. 5, Figure 2-4; 20; 63, p. 24; 66, pp. 1, 3, 5, 7). Fish caught on the St. Johns River include blue gill, redear, red breast, sunfish, catfish, mullet, bass, crappie, sea trout, weakfish, redfish, snook, and shrimp (Ref. 66, p. 3).

Food Chain Individual Factor Value: 45 (Ref. 1, Section 4.1.3.3.1)

4.1.3.3.2 Population

4.1.3.3.2.1 Level I Concentrations

No Level I samples were collected.

Level Concentrations Value: Not Scored
(Reference 1, Section 4.1.3.3.2.1)

4.1.3.3.2.2 Level II Concentrations

Actual contamination at Level II concentrations was documented in the St. Johns River at sediment sample locations KMC-IT-SD-14 (collected in February 2001), and SC-12 and SC-14 (collected in August 2008) (Refs. 5, Figure 2-4, Appendix D, p. 112; 63, pp. 16, 30, 32, 651, 691; 72, pp. 6, 7, 8). Commercial and subsistence fishing occur on the St. Johns River from the Arlington Expressway Bridge (U.S. 90 or County Road 115 or Matthews Bridge) to the mouth of the river, which includes the zone of contamination where sediment samples KMC-IT-SD-14, SC-12, and SC-14 were collected (Refs. 5, Figure 2-4; 20; 63, p. 24; 66, pp. 1, 3). An estimate of the fisheries' annual production, however, is not available; therefore, the annual production is estimated to be unknown but greater than zero.

Level II Concentrations Value: 0.03
(Reference 1, Section 4.1.3.3.2.2)

4.1.3.3.2.3 Potential Human Food Chain Contamination

Potential human food chain targets were not scored because potential contamination does not significantly contribute to the overall site score.

Potential Human Food Chain Factor Value: Not Scored
(Reference 1, Section 4.1.3.3.2.3)

4.1.4.2 Environmental Threat Waste Characteristics

4.1.4.2.1 Ecosystem Toxicity/Persistence/Bioaccumulation

The ecosystem toxicity, persistence, and bioaccumulation factor values for the hazardous substances detected in the source samples with containment factor values of greater than 0 are summarized in Table 38. Arsenic, DDD, and DDT were detected in sediment samples collected from the St. Johns River within the TDL. The combined ecosystem toxicity, persistence, and bioaccumulation factor values are assigned in accordance with Reference 1, Section 4.1.4.2.1. Also see Section 2.2.2 for Sources 1 and 2 and Section 4.1.2.1.1, Observed Release by Chemical Analysis, of this HRS documentation record.

TABLE 38: Ecosystem Toxicity/Persistence/Bioaccumulation

Hazardous Substances	Source No.	Ecosystem Toxicity Factor Value[7]	Persistence Factor Value[1]	Bioaccu-mulation Value[6]	Ecosystem/ Toxicity/ Bioaccumulation Factor Value (Ref. 1, Table 4-21	Reference
Alpha-BHC	1,2	1,000[5]	1.0	50,000[2]	5E+7	2, pp. BI-7, C-2
Beta-BHC	1,2	1,000[4]	1.0	5,000[3]	5E+6	2, p. BI-7, C-2
Gamma-BHC	1,2	10,000[4]	1.0	50,000[3]	5E+8	2, p. BI-8, C-2
Alpha-chlordane	1,2	10,000[4]	1.0	50,000[3]	5E+8	2, p. BI-3
Gamma-chlordane	1,2	0[4]	1.0	50,000[3]	0	2, p. BI-3
DDD	1,2	10,000[4]	1.0	50,000[3]	5E+8	2, p. BI-4, C-1
DDE	1,2	10,000[4]	1.0	50,000[3]	5E+8	2, p. BI-4, C-1
DDT	2	10,000[4]	1.0	50,000[3]	5E+8	2, p. BI-4, C-1
Dieldrin	1,2	10,000[4]	1.0	50,000[3]	5E+8	2, p. BI-5
Endosulfan I	2	10,000[4]	1.0	50,000[3]	5E+8	2, p. BI-6
Endosulfan II	1	10,000[4]	1.0	5,000[3]	5E+7	2, p. BI-6
Endrin	1	10,000[4]	1.0	50,000[3]	5E+8	2, p. BI-6
Endrin aldehyde	2	0[4]	1.0	5,000[3]	0	2, p. BI-6
Heptachlor	2	10,000[4]	0.4	50,000[3]	2E+8	2, p. BI-6
Toxaphene	2	10,000[4]	1.0	50,000[3]	5E+8	2, p. BI-11
Arsenic	2	100[5]	1.0	500[2]	5E+4	2, p. BI-1

TABLE 38: Ecosystem Toxicity/Persistence/Bioaccumulation						
Hazardous Substances	**Source No.**	**Ecosystem Toxicity Factor Value[7]**	**Persistence Factor Value[1]**	**Bioaccu-mulation Value[6]**	**Ecosystem/ Toxicity/ Bioaccumulation Factor Value (Ref. 1, Table 4-21**	**Reference**
Lead	2	1,000[4]	1.0	50,000[3]	5E+7	2, p. BI-8

Notes:

1 Persistence value for rivers
2 Bioaccumulation factor value for saltwater
3 Bioaccumulation factor value for freshwater
4 Ecotoxicity for freshwater
5 Ecotoxicity for saltwater
6 The St. Johns River is tidally influenced and contains brackish water (Ref. 79, p. 2). Therefore as stipulated by the HRS, the higher of the two ecotoxicity and ecobioaccumulation factor values are used (Ref. 1, Sections 4.1.3.2.1.3 and 4.1.4.2.1.3).

BHC Hexachlorocyclohexane
DDD Dichlorodiphenyldichloroethane
DDE Dichlorodiphenyldichloroethylene, p,p-
DDT Dichlorodiphenyltrichloroethane, 4,4-
Ref. Reference

Ecosystem Toxicity/Persistence/Bioaccumulation Factor Value: 500,000,000
(Reference 1, Section 4.1.4.2.1, Table 4-21)

4.1.4.2.2 Hazardous Waste Quantity

TABLE 39: Hazardous Waste Quantity		
Source No.	**Source Type**	**Source Hazardous Waste Quantity**
1	Backfilled surface impoundment	866.66
2	Contaminated soil	>0
Sum of values		866.66

Note:

> Greater than

The hazardous constituent quantity for Source No. 1 is not adequately determined. The estimated volume of the backfilled surface impoundment is about 2,166.66 yd^3 (see Source 1, Section 2.4.2.1.3 of this HRS documentation record).

The hazardous constituent quantity for Source No. 2 is not adequately determined. The area of contaminated soil located throughout the Kerr-McGee property is undetermined but greater than 0 (see Source 2, Section 2.4.2.1.3 of this HRS documentation record).

Hazardous Waste Quantity Factor Value: 100
(Ref. 1, Table 2-6)

Toxicity/Mobility Factor Value: 10,000
Hazardous Waste Quantity Factor Value: 100
Toxicity/Mobility Factor Value × Hazardous Waste Quantity Factor Value: 1,000,000

4.1.4.2.3 Calculation Of Environmental Threat
Waste Characteristics Factor Category Value

The waste characteristics factor category was obtained by multiplying the ecosystem toxicity/persistence and HWQ factor values, subject to a maximum product of 1×10^8. Then this product was multiplied by the bioaccumulation potential factor value, subject to a maximum product of 1×10^{12}. Based on this product, a value was assigned in accordance with Reference 1, Table 2-7.

Ecosystem Toxicity/Persistence Factor Value: 10,000.00
Hazardous Waste Quantity Factor Value: 100

Ecosystem Toxicity/Persistence Factor Value ×
Hazardous Waste Quantity Factor Value: 1×10^6

Ecosystem Toxicity/Persistence Factor Value ×
Hazardous Waste Quantity Factor Value (1×10^6) × Bioaccumulation Factor Value (50,000): 5×10^{10}

Waste Characteristics Factor Category Value: 320

(Reference 1, Table 2-7)

4.1.4.3 Environmental Threat Targets

Level I Concentrations

No Level I concentrations have been documented.

Level II Concentrations

The West Indian Manatee, a federally designated endangered species, inhabits the St. Johns River, including the portion within the TDL (Refs. 20; 59, p. 21966; 66, pp. 2, 3, 5; 71). Also, the zone of contamination where sediment samples KMC-IT-SD-14, SC-12, and SC-14 were collected is located within the Lower St. Johns River Manatee Refuge (Refs. 5, Figure 2-4, Appendix D, p. 112; 20; 59, pp. 21966, 21968, 21969, 21970, 21971; 63, pp. 24, 30, 32, 651, 691; 72, p. 6). Because the West Indian Manatee inhabits the Lower St. Johns River Manatee Refuge; these sensitive environments will be evaluated together. Also, the shortnose sturgeon, a federally designated endangered species, inhabits the St. Johns River, including the portion within the TDL (Refs. 20; 66, pp. 1, 2; 71).

Most Distant Level II Sample

Sample ID: SC-12
Distance from the probable point of entry: About 740 feet from PPE 1 and about 190 feet from PPE 2 (Refs. 20; 63, pp. 24, 30).

4.1.4.3.1 Sensitive Environments

4.1.4.3.1.1 Level I Concentrations

Sensitive Environments

Level I sensitive environments were not scored.

Wetlands

Level I wetlands were not scored.

Level I Concentrations Value: Not Scored

4.1.4.3.1.2 Level II Concentrations

Sensitive Environments

The West Indian (Florida) Manatee (*Trichechus manatus latirostris*), a federally designated endangered species, inhabits the St. Johns River, including the portion within the TDL (Refs. 20; 59, pp. 21966, 21971; 66, pp. 2, 3, 5; 71). The zone of contamination, where sediment samples KMC-IT-SD-14, SC-12, and SC-14 were collected, is located within the habitat of the West Indian Manatee (Refs. 5, Figure 2-4, Appendix D, p. 112; 20; 59, pp. 21966, 21971; 63, pp. 16, 24, 30, 32, 651, 691; 72, p. 6). The U.S. Fish and Wildlife Service designated a portion of the St. Johns River and adjacent waters in Duval, Clay, and St. Johns Counties as the Lower St. Johns River Manatee Refuge (Ref. 59, pp. 21966, 21969, 21970, 21971). The zone of actual contamination is also located within the Lower St. Johns River Manatee Refuge (Refs. 5, Figure 2-4, Appendix D, p. 112; 20; 59, pp. 21966, 21968, 21669, 21970, 21971; 63, pp. 16, 24, 30, 32, 651, 691; 72, p. 6). Also, the Shortnose Sturgeon (*Acipenser brevirostrum*), a federally designated endangered species, inhabits the St. Johns River, including the portion within the TDL (Refs. 20; 66, pp. 2, 3, 5; 71).

Level II Sensitive Environment Targets

TABLE 40: Level II Sensitive Environment Targets			
Sensitive Environment	**Distance from PPE to Nearest Sensitive Environment**	**Sensitive Environment Value (Ref. 1, Table 4-23)**	**References**
Habitat known to be used by Federal designated endangered species (Lower St. Johns River Manatee Refuge, West Indian Manatee)	0 feet from PPE 1 0 feet from PPE 2	75	1, Table 4-23; 20; 59, pp. 21966, 21971; 66, pp. 2, 3, 5; 71
Habitat known to be used by Federal designated endangered species (Shortnose sturgeon)	0 feet from PPE 1 0 feet from PPE 2	75	1, Table 4-23; 20; 66, pp. 2, 3, 5; 71

TABLE 40: Level II Sensitive Environment Targets			
Sensitive Environment	**Distance from PPE to Nearest Sensitive Environment**	**Sensitive Environment Value (Ref. 1, Table 4-23)**	**References**
	Sum of Values	**150**	

Wetlands

Level II contamination of HRS eligible wetlands has not been identified (Refs. 5, Figure 2-4, Appendix D, p. 112; 20; 63, pp. 24, 30, 32; 67).

Level II Concentrations Value: 150
Reference 1, Table 4-23

4.1.4.3.1.3 Potential Contamination

Sensitive Environments:

Potential sensitive environments were not scored because potential contamination does not significantly contribute to the overall site score.

Wetlands:

Potential contamination of wetlands was not scored because potential contamination does not significantly contribute to the overall site score.

Potential Contamination Factor Value: Not Scored